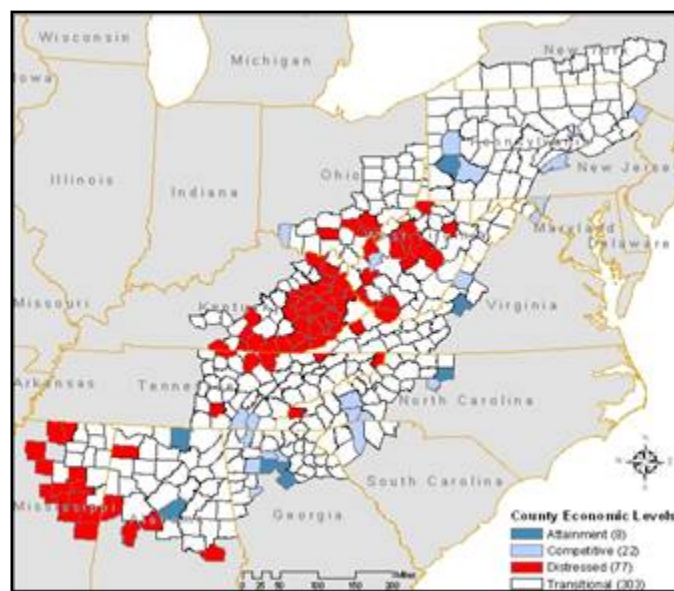


Sources of Regional Growth in Non-Metro Appalachia

Appendix C – White Papers *(Full Text of Growth Path Paper Summarized in Vol.1, Ch.2)*



Prepared for the Appalachian Regional Commission

Prepared by:
MIT Dept. of Urban Studies & Planning
Regional Technology Strategies, Inc.

August 2006

PREFACE

This document contains the full text of white papers prepared on the topic of economic growth paths. The findings from these documents are summarized separately in Volume 1, Chapter 2.

Project Background. The *Sources of Growth* project is part of a series of research efforts funded by the Appalachian Regional Commission to improve our understanding of factors affecting economic growth in rural and distressed areas. As stated in the Volume 1 Introduction, “the starting premise of this project is that there can multiple paths that an area can pursue in successfully enhancing job and income creation. They may build on natural resources, cultural resources, human resources, local amenities, institutional facilities or location advantages. The resulting direction of economic growth may involve manufacturing or supply chain development, resource extraction or tourism development, educational development or trade center development.” This research is intended to provide a basis of information that can ultimately be useful for enhancing the effectiveness of policies and tools aimed at improving the region’s economic development. This volume represents an Appendix of backup material for a series of reports:

- ***Executive Summary*** –synthesis of findings from all work products related to the study’s four main research components.
- ***Volume 1, Project Background and Prior Research on Economic Growth Paths*** – study objectives, characteristics of non-metro Appalachian counties, classification of economic development growth paths, synopsis of white paper findings on theory relating to economic development growth paths, and empirical literature review on spatial aspects of economic development.
- ***Volume 2, Case Studies of Local Economic Development Growth Processes*** – findings related to growth paths as observed for selected case studies covering manufacturing clusters, supply chain-based development, tourism development, technology development, and diversification from resource-based economies.
- ***Volume 3, Statistical Studies of Spatial Economic Relationships*** – findings from a series of econometric modeling and GIS-based analyses, focusing on roles of spatial adjacency, market access and transportation in determining economic growth and development of trade centers.
- ***Volume 4, Tools for Economic Development*** – description of new and updated tools available to ARC and its Local Development Districts to assess economic development opportunities and potential directions for economic growth.

- ***Appendices*** –
 - (A) Spatial Analysis of Economic Growth,
 - (B) Economic Analysis of Hub-Spoke Relationships,
 - (C) White Papers on Economic Growth Theories

WHITE PAPERS

Clustering Versus Dispersing Economic Activities

Asset-Based Development

Trade Centers

Reassessing Clustering In Light Of Globalization And Offshore Outsourcing

Learning Based Economies In Non-Metro Counties

WHITE PAPER

CLUSTERING VERSUS DISPERSING ECONOMIC ACTIVITIES

April 28, 2005

Shin Xin Li

xinli@mit.edu

MIT ARC Team

Massachusetts Institute of Technology
Department of Urban Studies and Planning
Multiregional Planning Research Group
Cambridge, MA 02139

Introduction

For our regional-growth pattern study of agglomeration and dispersion economies, we refer to two sets of location theories. The first set includes the various location theories in which agglomeration economies play a major role, claiming that industries have a tendency to concentrate around an economic center, and the second set refers to the arguments that economic activities may also spread away from the center, sometimes even to other regions and globally along supply chains. Among those agglomeration theories, Perroux's growth-pole theory has played an influential role in stimulating research on agglomeration economies and industrial complexes. Since the 1990s, Porter and his colleagues introduced the term "clusters," substituting it for the related terms of growth poles, industrial districts, territorial and industrial complexes, and other terms that were used by regional and other analysts (e.g., Isard 1956) in earlier location and industrial-organization literature. Porter (1998:199) defines a cluster as "a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities." For cluster theorists, firms are expected to rely upon agglomeration economies to determine location. Among the clustering studies we cover are those conducted by Regional Technology Strategies (RTS) in Appalachia.

Recently, however, some researchers, such as Henderson, Shalizi, and Venables (2001) and Polenske (2003), have proposed a challenging view to the concept of agglomeration economies: they focus on patterns of industrial location that benefit from the economies of dispersion. They argue that (i) regional economic growth follows two patterns: concentration and dispersion; and (ii) clustering and dispersion are not contradictory, but may be mutually complementary.

In the remainder of this paper, we synthesize these two sets of location theories and explore their possible applications for the Appalachian region. In particular, we are interested in the following four issues (i) what factors are mainly responsible for the locational patterns of firms, (ii) what techniques do analysts use for the measurement of agglomeration and dispersion, (iii) how could these analytical techniques be applied to the case of the Appalachian region, and (iv) what are the policy implications of the theories for regional or local practitioners.

1. Economic Drivers that Cause Clustering and Dispersing

Many economic and geography analysts assume that the prosperity of a city or a town is mainly a result of the accumulation of local firms' economic activities. Various location theorists thus have been trying to answer one basic question: what factors drive firms to make their location decisions. Answers for the question are diverse. For example, some location analysts, such as Isard (1956), suggest that firms prefer places with a high market potential, while some, such as Scott (1998), assert that transaction costs, including transportation and communication costs, are responsible in firms' location decisions. Others (e.g., Henderson, Shalizi, and Venables 2001) stress positive externalities, such as the spillover effects of clustered firms. In the following section, we review major theoretical frameworks for the analysis of agglomeration and dispersion of firms.

2.1 Drivers of Agglomeration

Underlying the concept that agglomerations are drivers of development is the assumption that a concentration of economic activities in one area, such as an urban area, creates opportunities for agglomeration economies to play a major role in helping a region to grow (Krugman 1991). The

leading industry in an urban center and its related sectors have a strong tendency to concentrate geographically to enjoy these agglomeration economies. The agglomeration economies enable firms to share indivisible facilities, labor and material suppliers, gains of large-scale production, and investment or operational risks. In addition, geographical proximity enables rapid technological innovation and substantial cost reductions through positive externalities and scale economies. An industrial cluster thus becomes an “engine” for local or state economic growth. The benefits from early-stage clusters will trickle down to a wider and wider geographical area because of the agglomeration economies.

I discuss four different components that help create and sustain these agglomeration economies: transportation and transaction costs, growth poles and backward and forward linkages, lifecycles of clusters, and network impacts.

2.1.1 Transportation and Transaction Costs

According to neoclassical theory, firms as profit-driven entities make their location-decisions in pursuit of profit maximization. Location analysts originally considered transportation costs the prime determinant for the location of manufacturing firms. According to traditional location theories, the most desirable locations for a firm, in general, are places where transport costs can be minimized. Optimum locations differ according to the nature of the firm’s output. While a firm engaged in a weight-gaining industry should locate near consumer markets, the weight-losing industry should locate in the proximity of natural resources. Analysts using this theoretical framework successfully explain many of the reasons why most of the mining-related industries are located around the central part of the Appalachian region where abundant coal resources exist. (Alonso 1964, Hoover 1948, Isard 1956)

Some economic geographers, such as Storper and Venables (2002), revise the traditional location theories by introducing the concept of transaction costs. In the post-Fordist mode of production, they maintain that manifold intermediate tasks done by a wide variety of specialized firms should be coordinated through transactions to produce final goods. For analysts using this theory, intraindustry transactions (business-to-business) thus became a crucial factor for business decision-making. The increase of transactions, of course, led to growing trade costs. The share of trade costs to the total production costs remains constantly high despite technological advances in transportation and communication and the emergence of knowledge-based industries. The motivation for the abatement of transaction costs, they conclude, led specialized firms to concentrate geographically.

2.1.2 Growth Poles and Backward-Forward Linkages

Growth-pole theory, introduced by Perroux in 1950, emphasizes the role of a core industry in a local economy. The core industry requires continuous technological innovation and produces products with a high income elasticity of demand. One of the most important qualifications for an industry to be a core industry is for it to have high backward/forward linkages to other related industrial sectors. A growth-pole strategy works only when the core industry can stimulate other industrial sectors, leading to their simultaneous growth. However, a growth-pole-centered, mono-centric local economy is in a danger of chronic economic downturns, once the output of the propulsive industry declines or the industry relocates its production bases out of the region, as Detroit has experienced since the late 1960s.

2.1.3 *Lifecycle of Clusters*

The lifecycle of a cluster differs from the lifecycle of a product (discussed later) in that the cluster goes through the life cycle at one location, whereas theorists conceive of the different stages of a product life cycle occurring at different locations globally. In general, a cluster undergoes four phases: embryonic clusters, established clusters, mature clusters and declining clusters (DTI 2003). Embryonic clusters refer to those at an early stage of industrial growth, triggered by exogenous factors, such as policy incentives. Once the policy intervention succeeds in forming a desired scale of industrial concentration, the cluster becomes fully formed at the second stage with considerable potential for further growth. In the next stage, the now mature cluster reaches a relatively stable status. The cluster then has to search for possible growth opportunities through institutional innovation in order to enter a new cluster cycle to avoid the declining stage.

2.1.4 *Network Impacts*

Rosenfeld (2001) has extensively discussed the feasibility of promoting network clusters of groups of companies for mutual competitive advantage in rural areas. He maintains that collaborations, involving formal (e.g., nonprofit organizations) and informal (e.g., agricultural cooperatives) relationships, are likely to be initiated particularly well in rural areas. He distinguishes soft networks from hard networks in that, he thinks, the former are more readily occurring in rural clusters than in urban centers. Hard networks are formed among relatively small groups of companies, in which they pursue specific business objectives through formal agreements, while soft networks, similar to a localized trade association, have open membership and usually do not have contractual business ventures. He claims that it is the soft network that creates rural clusters.

2.2 Drivers of Dispersion

While the agglomeration economies facilitate firms to cluster, as discussed in Section 2.1, the dispersion of firms happens when the diseconomies of agglomeration outstrip productivity gains from the clustering. Henderson, Shalizi, and Venables (2001) present three essential types of forces for dispersion economies to occur: (i) negative externalities from congestion, (ii) the limited supply of immobile factors (e.g., land and labor), and (iii) the possible market outside the cluster.

At a regional level, Storper and Walker (1989) identify four location patterns of industries—localization, clustering, dispersing, and shifting centers. They maintain that the spatial concentration of industry and the dispersal of plants from established industrial centers are two inevitable stages a region could experience. I interpret the four location patterns as three possible consequences in terms of dispersion. First, with the growth of clusters, negative externalities force firms to seek their optimal locations outside the cluster, as a result of the collapse of the original cluster. Second, the dispersion force may lead to the formation of a new cluster and, at the same time, cause the destruction of a declining cluster. Third, we may also witness the growth of a mature cluster that results in the creation of a subcluster in the periphery, which eventually enhances the competitiveness of a region in the world market.

From the literature on dispersion of industries, I distinguish three types of dispersion mechanisms: supply chains, networks, and product life cycles.

2.2.1 Supply Chains¹

A supply chain, according to Beamon (1998: 292), refers to “a set of relationships among suppliers, manufacturers, distributors, and retailers that facilitates the transformation of raw materials into final products”. The initial objective of supply-chain management (SCM) is to reduce firms’ inventory and transportation costs and/or to improve their service levels. When researchers study supply chains in an industrial or regional context, they are concerned about the roles of SCM in firms’ location choice and industrial restructuring.

Firms in different manufacturing sectors have different product characteristics, demand patterns, and require service levels, so that they prefer different supply chains and logistic systems. Polenske (2003) develops the concept of “dispersion economies” with the belief that various factors are now causing some firms to move away (disperse) from concentrated centers of economic activity, and a considerable amount of this dispersal occurs along supply chains. Glasmeier and Kibler (1996) examine the dispersing trend of wholesale and distribution industries in the United States. They find that locations of wholesale establishments and warehouses have shifted from urban areas to rural and adjacent suburban areas largely due to the technological improvements in inventory management, warehouse structure, as well as transportation deregulation, all of which are critical components of supply-chain management. It seems that with the dramatic advance in information technology, the expansion of globalization, and the decrease of transportation costs as a share in the total cost, firms have larger scope and more flexibility in their supply-chain design.

In terms of structural approaches in SCM, cost reduction by moving to lower labor-cost regions often outstrips increased delivery costs if transportation costs and duties are low. Additionally, improvement of the coordination mechanism makes it possible for an industry or a firm to access more sophisticated products and services at a greater distance with higher quality than before. (Flaherty 1996)

2.2.2 Dispersion through Networks

Networks through high-tech instruments have made industrial dispersal happen more easily and rapidly than before. Defined by Teubal, Yinnon, and Zuscovitch (1991), a network organization linking firms or economic agents represents an intermediate “system of governance” that lies between the firm and the market. Traditionally, there are different types of networks, including interfirm networks, employment networks, social networks, and political networks. Up to now, analysts view the scope of networks as extending from pure simple connections of similar characteristics to more complex relationships among all economic participants, including private firms, government agencies, universities, intermediary agencies, and communities (Harrison 1992). Linkages among those economic actors can occur at various levels, from local retail districts, which stay close to urban residential communities, to specialized auto-parts towns that serve regional auto-manufacturing factories, and to research and development (R&D) institutions that disseminate their newly developed technologies at state and world levels. Therefore,

¹ Some parts of this section are based upon or paraphrased from Yu Li (2004).

depending on the growth potential of an industry, patterns of activities, innovatory capacity, and governmental structure, multilevel networks (local, regional, national, and international) lead to various dispersion tendencies of economic activities. In this case, policy makers should take into consideration the impacts of other economic players on firms' location decision in addition to interfirm networks.

2.2.3 Product Dispersion during Its Lifecycle

An alternative way analysts use to consider agglomeration and dispersion is by examining the product lifecycle (Norton and Rees 1979). Norton and Rees argue that the decentralization of the U.S. manufacturing belt in the Northeast to the South and West is due to the product cycle, which is characterized by the cumulative effects of the technological innovation and industrial growth. Wells (1972) demonstrates the impacts of the product cycle on international trade as well as on the U.S. production. He discovers that U.S. manufacturers generally, taking advantage of technological advance, export their newly developed products to foreign countries at an early stage of the product cycle. When the technology spills over to the whole country or even beyond the nation's boundary, the exports after a while, however, decline. Eventually, in the fourth phase of the product cycle when foreign production reaches sufficient scale and the costs saved are low enough to cover the transportation and tariff protection, the United States becomes a major importer of the product. In the past decade, we observe electronics industries dispersing from a limited number of regional centers, to the whole country, and now to the rest of the world.

3. Empirical Evidence

Isard, Porter, and other analysts have observed industrial clusters in many parts of the world. However, firms in each cluster behave in diverse ways, and each cluster has different economic impacts on its periphery and on the whole region. The economic effect of clusters on a region is two-fold. Mainstream regional analysts (e.g., Krugman 1991; Fujita, Krugman, and Venables 1999) think that agglomeration will increase the competitiveness of a local economy and generate positive spillover effects on the periphery. Other analysts (e.g., Markusen, Lee, and DiGiovanna 1999). argue that the concentration of firms seems to create negative effects by drawing resources from peripheries and leaving these areas underdeveloped. Many empirical studies show that new regional-growth complexes are often near well-developed metropolitan regions or medium-size cities, such as Orange County near Los Angeles and the Santa Clara Valley near San Francisco.

Rosenfeld is one of the biggest contributors to Appalachian clustering studies. He and his colleagues have investigated and identified a substantial number of industrial clusters in Appalachia, including Tennessee's Auto clusters and Kentucky's Houseboat clusters in rural Appalachia (Rosenfeld 1999), Mississippi's CIT (Communications and Information Technologies) clusters (RTS 2001), South Carolina's technical college clusters (Rosenfeld 2004), and so on. Recent research by Jack Faucett Associates and Economic Development Research Group (2004) is another valuable contribution to the clustering studies in Appalachia, in which the authors explore the competitiveness of selected export-based clusters and provide an insight into how industrial clusters in the Appalachian region are affecting geographic concentration, labor costs and productivity, capital investment, and capacity utilization. They analyze industry concentration and interregional transactions by using economic-impact multipliers and other measures.

Analysts (e.g., Li and Polenske 2003) have also found some evidence of dispersion economies in the metal working, cokemaking, and household appliance sectors. The geographical expansion of clusters reflects the dispersion trend. In this paper, dispersion economies indicate positive externalities created when interlocked firms or industries are geographically spread within a large region, such as the metalworking industry in Chicago. We will provide evidence through our qualitative and quantitative analyses that dispersion economies and agglomeration economies may coexist in the process of economic growth in the Appalachian region.

4. Measures Used to Identify Agglomeration and Dispersion Economies of Scale

Analysts often use *quantitative* techniques, such as location quotients, input-output models, and supply-chain management models to identify agglomeration and dispersion economies of scale. These quantitative approaches not only provide an initial tool for identifying potential horizontally and vertically integrated clusters, but also indicate the distribution of different industries in the region. Because they offer little information on how individual firms or industries interact with each other, an analyst must employ *qualitative* analyses, such as surveys and interviews, as well.

4.1 Geographical Concentration Index

As outlined in Task 1, Part 5, there are two distinct groups of measures of geographical concentration. One is location quotient (LQ) and horizontal clustering location quotient (HCLQ), and another is the Herfindahl-Hirschman Index (HHI) and Ellison-Glaeser index, as discussed below. Appendix A contains the formulae for the calculation of LQ, HCLQ, and HHI.

4.1.1 Location Quotient (LQ)

LQ is probably the most commonly utilized measure by regional analysts to identify clusters of similar industrial concentrations. The location-quotient technique measures the relative concentration of a certain industry in a reference area (e.g., Appalachian region), based upon a calculated ratio of employment share between a county's economy and the economy of the reference area. However, the LQ measure has a major limitation in that the value provides virtually no information regarding the absolute scale of the industry in the study region (Feser and Goldstein 2002); in addition, implications from it may vary as the analyst varies the number of industries used in the analysis.

4.1.2 Horizontal Clustering Location Quotient (HCLQ)

HCLQ, adopted by Fingleton, Iglioni, and Moore (2004), becomes a substitute for LQ, while serving the same purpose. Analysts use the HCLQ to reflect the relative local importance of an industry and the size of the agglomeration. For the calculation of HCLQ, we can manipulate county-level employment data from *County Business Patterns* from the U.S. Census Bureau that we have in our ARC database (Task 1, Part 1 memo).

4.1.3 Herfindahl-Hirschman Index (HHI)

Different from LQ or HCLQ, which indicate whether there is a concentration of the industry in county i , analysts can use the HHI, calculated from the sum of the industrial shares of all counties in the Appalachia region, to determine the degree of dispersion of industry j in the Appalachia region (Kim, Barkley, and Henry 2000). In other words, HHI only tells us whether

industry j is identically distributed for each county (in this case, $HHI = 0$) or not, without providing information on in which county the concentration appears.

4.1.4 *Other Geographic- Concentration Measures*

The Ellison-Glaeser Index is another indicator of geographical concentration (Ellison and Glaeser 1997). The concept is similar to HHI, but it eliminates the effect of the random distribution of establishments on firms' location by comparing the estimated spatial HHI for industry j and the expected value of HHI.

In general, each analyst must determine based upon the type of issue to be studied as to which of the measured I review here, or other measures, such as Gini coefficients, are best to use for a particular study. In Task 1, Part 5, the MIT ARC team shows some of the differences that may occur in analyses of Appalachia from the use of some of the above indices.

4.2 Supply-Chain Analyses

To study supply chains, analysts generally use a combination of case studies and quantitative techniques, such as input-output analysis (Li 2004). Through three case studies, Li and Polenske (2004) show that firms achieve dispersion economies in various ways, depending on the nature of the industry. For example, some firms choose to stay in proximity to final customers; some strategically locate plants in different regions to diversify business risks rather than depend on a single region's economic cycle; and some tend to locate near research institutes to take advantage of easier access to their knowledge assets.

We distinguish two terms—supply chain and value-added chain. Although both are interchangeably used in some articles, they, in fact, are not equivalent. On the one hand, analysts such as Glasmeier and Kibler (1996) associate the concept of supply chain with infrastructure and transportation networks (e.g., rail, truck, and air routes, storage facilities, and final distribution centers), thus the logistics system between producers and consumers. They focus on the interrelationship between functionally specialized firms: the minimization of the transport cost of goods and/or the maximization of the transport volume of goods in support of just-in-time delivery. On the other hand, analysts, such as Porter (1990), who use the value-added-chain concept, emphasize the value created by a firm's activities, not necessarily through a supply chain, focusing on the management of the flow of goods and services for the maximization of the final products' value.

Our concern here is whether or not and how interrelated firms along the supply chain disperse throughout the region. If available, we could use county-to-county freight/trade data for this analysis.

4.3 Qualitative Analysis

Analysts use qualitative studies not only to confirm the findings of the quantitative studies, but also to identify potential industrial clusters that may not be discovered through the quantitative data analysis. Of principal interest to us for the study of distressed counties in Appalachia is the industrial interrelationship between different kinds of firms. Through qualitative analysis, we

want to explore questions such as how these competitive and complementary firms cooperate with each other and what connections force them to do so.

Analysts could use the uneasy 3-C triangle diagram proposed by Polenske (2004) to understand how the interrelationships between competition, collaboration, and cooperation (3Cs) constrain or enhance local, national, and global networks of firms. She summarizes various factors that make collaboration and cooperation successful into three concepts: proximity, trust, and learning. After applying these three concepts to the worldwide cases, she proposes three industrial-restructuring models, each of which seems to have success stories. They are the Italian Model, in which “small firms cluster in a particular region and thrive in an innovative, cooperative environment (Polenske 2004: 1036),” the Japanese Model, in which “small firms cluster near large firms to allow for JIT [just-in-time] production (Polenske 2004: 1038),” and the Global Model, in which “networks exist among all size of firms” (Polenske 2004: 1039). We assume that each of these three models may appear in the Appalachia region.

For the existing clusters and a group of industries along a supply chain, we consider it necessary to investigate the actual spatial interactions among firms. What industrial-restructuring models (Italian, Japanese, or global model) do these clusters follow? How do these firms in the cluster compete, collaborate, and cooperate? In addition to the case studies, the ARC team could conduct surveys and interviews of key industry representatives to help expand our discussions of business relationships in the region and to understand how the growth drivers listed in Section 2 function in the regional economy. If available, we could use such information to complement the findings from the case studies.

5. Relationship with Other White Papers

Our discussion on agglomeration/dispersion economies is interrelated with the topics of the other White Papers. The asset-based discussion provides additional information regarding the industrial environment that nurtures firms in the area and attracts businesses to the region. A place with a favorable industrial environment is likely to create a new cluster or destroy a declining industrial complex, if certain requirements are met. Trade centers actually characterize one form of a cluster, in which small firms play crucial roles for the local economy. Learning-region analysts (e.g., Asheim 1999) emphasize the interactive network within and among firms, governments, institutions, non-profit organizations, and communities. This approach could expand our horizon from a simple linkage of industries alone to a complex relationship among a wider variety of stakeholders in larger economic and social settings.

6. Implications for Policy-Makers

Rosenfeld (1997a: 13) suggests some strategies that foster long-term economic growth.

- Learn how businesses interact and clusters work
- Support clusters because of their economic dominance, strategic importance, or leadership and potential
- Focus on subsidiary systems and satellite systems in rural areas²
- Improve the technical support services

² According to Rosenfeld, subsidiary and satellite systems refer to groups of clusters in rural areas that are related to each other or to some remote urban-based markets and customers, a phenomenon mainly resulting from ease of electronic exchanges.

- Invest in social capital and social infrastructure
- Empower and listen to cluster leaders
- Encourage cross-fertilization of ideas across clusters
- Recruit companies that fill gaps in cluster development
- Develop and organize supply-chain associations
- Support employee/entrepreneurs

However, not all of the above are applicable to nonmetropolitan counties in Appalachia. In light of the Appalachia Regional Commission's (ARC's) interest in stimulating the economic growth of nonmetropolitan counties, especially those they classify as distressed counties, we propose consideration of the following strategies.

6.1 Restructure Industrial Composition

The strategy of restructuring the existing industrial composition does not necessarily mean the creation of completely new sets of industries in new locations. In general, new industries led by a restructuring process tend to branch off from existing sectors, through essential modifications of products, fundamental changes in the mode of production, or technological innovation. (Bluestone and Harrison 1982.) Although this pattern can be applied even to traditional mining counties in West Virginia, the restructuring cannot be easily carried out without sufficient research and development (R&D) support.

6.2 Create Traded Industries

According to Porter (2001), traded industries, i.e., those firms that produce products that are exported or imported, are distinct from local industries, such as restaurants, local utilities, and local services that fulfill mainly local demand. The former, he says, are the drivers of economic development. They directly or indirectly create the demand for the latter. Economic-base analysts, such as Bendavid-Val (1991), call these industries "national industries" whose intermediate-goods demand comes mainly from outside the region. In technical terms, traded industries have a larger multiplier effect than local industries. In his paper, Porter identifies 50 traded industries, among which only a small number are geographically concentrated. In this sense, by referring to the list of 50 traded industries, planners in nonmetropolitan counties in Appalachia have the opportunity to find their niche in the regional economic system.

6.3 Support Complementary Industries in the Periphery

New regional-growth complexes are often found proximate to well-developed metropolitan regions or medium-sized regional cities to take advantage of the favorable production environment. This strategy is applicable to the nonmetropolitan counties in Appalachia that stay contiguous to mature clusters.

6.4 Increase Locational Capacities

The basic concept of locational capacities refers to the capacity of a plant, firm, or industry to secure what it needs from a region, including laborers, suppliers, and buyers (Storper and Walker

1989). Currently, the meaning of locational capacities is becoming more complex. It refers to “the creative powers made possible by technological innovation, organizational advance, labor rationalization and skills development, and rate of investment” (Storper and Walker 1989:74). Policy makers should notice the relatively subtle shift of the above definition, i.e., that to maintain the attractiveness of a region, policy makers must supplement a static supply of laborers, suppliers, and buyers with continuous improvements of exogenous factors.

6.5 Policy Interventions at Different Stages of a Cluster

At different stages of the cluster cycle, policy makers may need to exert different policy interventions (DTI 2003). For example, in embryonic clusters, the government may need to take the lead in encouraging collaboration and providing appropriate information to start-ups. Promoting openness and innovation in mature or declining clusters is essential, but not necessarily sufficient, to diminish the danger of regional isolation. Not only does this approach help to maintain the competitiveness of traditional clusters, but it is also the starting point for encouraging the development of new industries. Other evidence suggests that certain types of intervention remain appropriate throughout the life cycle of a cluster but the degree of their intensity may be different by institutions and other intangible assets each cluster has.

6.6 Regional and Global Supply-Chain Management

Regional supply-chain management enables firms within the region to improve their overall competitiveness at the channel rather than at the firm level. As defined, a supply chain involves various functions of firms requiring different development strategies, by which the chain of firms can improve the channel efficiency. Polenske (2001: 178-179) summarizes four policy implications based on her research team’s investigation of the Chicago metalworking supply chain: (i) different supply chains (e.g., custom chains and standard chains) require different production/distribution, (ii) the importance of logistics differs among firms, (iii) inbound and outbound transport needs differ, and (iv) the impacts of the industrial restructuring process differ among firms.

International trade increasingly facilitates firms that used to be locally served to search for global business partners. Regional supply chains have extended into the global context and have performed in multiple nations. This will make firms along these global chains face new challenges regarding export regulations, duty rates, exchange rates, and global competition. (Beamon 1998) Supply chains in Appalachia are not exempted.

7. Conclusion

Besides the Appalachia region, we have witnessed in many parts of the United States, economic growth as well as economic downturns, accompanied by the process of industrial agglomeration and dispersion. For the majority of nonmetropolitan counties in Appalachia, they may suffer economic depression resulting from labor and capital exaction by nearby industrial clusters, but they may also enjoy economic spillovers from those clusters. Rural policy-makers confront a major issue concerning how to take advantage of the existing agglomeration economies. At the same time, nonmetropolitan counties’ governments could make efforts to expand their business

network worldwide, in order to reduce the risk of being too dependent on local agglomeration economies. In this paper, we have discussed several factors that drive industries to agglomerate and disperse. We suggest three quantitative techniques: HCLQ and alternative geographic concentration indices to measure the concentration of industries, and supply-chain analyses to assist nonmetropolitan counties in determining how to make use of relevant supply chains. All of these quantitative analyses should be supplemented by qualitative analytical approaches. Finally, we provide six policy implications drawn from theoretical and empirical literature review.

Appendix A: Geographic-Concentration Indices

Location Quotient (LQ)

Formula: $LQ = (E_{ij} / E_{i_n}) / (E_j / E_n)$ or:
 $LQ = (E_{ij} / E_i) / (E_{i_n} / E_n)$
 where, E_{ij} is employment in industry i in area j
 E_j is total employment in area j
 E_{i_n} is national employment in industry i
 E_n is total national employment

Horizontal Clustering Location Quotient (HCLQ)

Two steps are involved to produce the HCLQ:

Step 1. Calculate \hat{E}_{ij} ; set $LQ = \frac{\left(\frac{\hat{E}_{ij}}{E_j}\right)}{\left(\frac{E_i}{E_n}\right)} = 1$ to get \hat{E}_{ij}

Step 2. Calculate $HCLQ$; $HCLQ = E_{ij} - \hat{E}_{ij}$

where, E_{ij} : actual employment of industry i in county j ;

E_j : total employment in county j ;

E_i : employment of industry i in Appalachia region;

E_n : total employment in Appalachia region;

\hat{E}_{ij} : estimated employment of industry i in county j when LQ equals 1.

Herfindahl-Hirschman Index

Formula: $HHI = g_j = \sum_{i=1}^n (s_i - x_i)^2 = \sum_{i=1}^n \left[\frac{N_{ij}}{N_j} - \frac{N_i}{N} \right]^2$

where, g_j : the degree of industry j 's spatial concentration
 n : the total number of regions
 s_i : the share of industry j 's employment in region i to that in the whole region
 (a group of n regions)
 x_i : the share of total employment in region i to that in the whole region
 N_{ij} : industry j 's employment in region i
 N_j : industry j 's employment in the whole region
 N_i : total employment in region i
 N : total employment in the whole region

Appendix B: Data Desired for the Analyses

Below is a tentative list of data sets we may use for our analyses. We make a preliminary identification of dependent and independent variables just to indicate how we could utilize different data sources in our analytical process. Our specific application of them will largely depend on what question(s) we want to answer and what assumption(s) we make.

Data	Source	Availability	Variable	Why and How
ERS/US DA County Typology	Economic Research Service, U.S. Department of Agriculture ¹	Yes	Dependent— Manufacturing based counties	This typology can attract our attention on manufacturing- dependent counties, thus reducing the scope of our analyses.
County Business Patterns	U.S. Census Bureau ²	Yes	Dependent/indepen- dent—Employment by NAICS/SIC code	Identify the economic base of each county. Employment change code
Freight Analyses Framework	U.S. Department of Transportation ³	State-level YES; County- level NO.	Independent— Freight Shipments by mode and by commodity.	Network analyses
IMPLAN	Minnesota IMPLAN Group, Inc ⁴	County-to- county NO	Independent— trade	Network analyses

Note: In most cases, we will calculate the dependent and independent variables by using data from the source indicated above. For example, for some of our economic-base analyses, we will calculate the horizontal clustering location quotients using County Business Patterns data.

¹ Economic Research Service, U.S. Department of Agriculture.

<http://www.ers.usda.gov/Data/TypologyCodes/> (access April 7, 2005)

² U.S. Census Bureau. <http://www.census.gov/epcd/cbp/view/cbpview.html> (access April 7, 2005)

³ Freight Management and Operations, Federal Highway Administration, U.S. Department of Transportation. http://ops.fhwa.dot.gov/freight/freight_analysis/faf/index.htm (access April 7, 2005)

⁴ IMPLAN Professional version 2.0: Social Accounting & Impact Analysis Software. April 1999. Minnesota IMPLAN Group, Inc. Stillwater, MN

References

- Alonso, William. 1964. *Location and Land Use*. Cambridge, MA: Harvard University Press.
- Asheim, Bjorn T. 1999. Interactive Learning and Localised Knowledge in Globalising Learning Economies. *GeoJournal* 49 (4):345-352.
- Beamon, Benita M. 1998. Supply Chain Design and Analysis: Models and Methods. *International Journal of Production Economics*. 55: 281-294.
- Bendavid-Val, Avrom. 1991. *Regional and Local Economic Analysis for Practitioners*. New York, NY: Praeger Publishers.
- Bluestone, Barry and Bennett Harrison. 1982. *The Deindustrialization of America*. New York: Basic Books, pp. 25-48.
- DTI (U.K. Department of Trade and Industry). December 2003. A Practical Guide to Cluster Development. <http://www.dti.gov.uk/clusters/ecotec-report/download.html> (accessed April 3, 2005).
- Ellison, Glenn and Edward L. Glaeser. Geographic Concentration in U.S. Manufacturing Industries: A Dartboard Approach. *Journal of Political Economy*. 105 (5): 889-927.
- Feser, Edward, and Harvey Goldstein. August 2002. Regional Technology Assets and Opportunities: The Geographic Clustering of High-Tech Industry, Science and Innovation in Appalachia. <http://www.arc.gov/index.do?nodeId=2574> (accessed April 3, 2005).
- Fingleton, Bernard, Danilo Camargo Iglioni and Barry Moore. 2004. Employment Growth of Small High-technology Firms and the Role of Horizontal Clustering: Evidence from Computing Services and R&D in Great Britain, 1991-2000. *Urban Studies*. 41(4): 773-799.
- Flaherty, M. Therese. 1996. *Global Operations Management*. New York: McGraw-Hill Company.
- Fujita, Masahisa, Paul Krugman, and Anthony J. Venables. 1999. *The Spatial Economy: Cities, Regions, and International Trade*. Cambridge, MA: MIT Press.
- Glasmeyer, Amy K. and Jeff Kibler. 1996. Power Shift: The Rising Control of Distributors and Retailers in the Supply Chain for Manufactured Goods. *Urban Geography*. 17(8): 740-757.
- Harrison, Bennett. 1992. Industrial Districts: Old Wine in New Bottles. *Regional Studies*. 26(5): 469-83.
- Henderson, J. Vernon, Zmarak Shalizi, and Anthony J. Venables. 2001. Geography and Development. *Journal of Economic Geography*, 1 (1): 81-105.
- Hoove, Edgar M. 1948. *The Location of Economic Activity*. New York: McGraw-Hill Book.
- Isard, Walter. 1956. *Location and Space Economy*. New York: John Willey & Sons.
- Jack Faucett Associates and Economic Development Research Group. 2004. Analysis of Global Competitiveness of Selected Industries and Clusters in the Appalachian Region.
- Kim, Yunsoo, David L. Barkley, and Mark S. Henry. 2000. Industry Characteristics Linked to Establishment Concentrations in Nonmetropolitan Areas. *Journal of Regional Science*. 40 (2): 231-259.

- Krugman, Paul. 1991. Increasing Returns and Economic Geography. *Journal of Political Economy*. 99(3): 483-499.
- Li, Yu, and Karen R. Polenske. 2004. Measuring Dispersal Economies. In *Entrepreneurship, Spatial Industrial Clusters and Inter-Firm Networks*. Trollhätten, Sweden: Universities of Trollhätten, Uddevalla: 615-634
- Li, Yu. 2004. *Analytical Input-Output and Supply Chain Study of China's Coke and Steel Sectors*. Master's Thesis (S.M.), Massachusetts Institute of Technology, Dept. of Urban Studies and Planning. Cambridge, MA.
- Markusen, Ann R., Yong-Sook Lee, and Sean DiGiovanna (Ed.). 1999. *Second-Tier Cities: Rapid Growth beyond the Metropolis*. Minneapolis, MN: University of Minnesota Press.
- Morley, Hugh R. April 21, 2005. The End of a Long Line: 950 Jobs Lost as New Jersey's Last Auto Plant Shuts Down. Bergen County, NJ: North Jersey Media Group, Inc.
- Perroux, Francois. 1950. Economic Space, Theory and Application. *Quarterly Journal of Economics*. 64 (1): 89-104.
- Polenske, Karen R. 2001. Competitive Advantage of Regional Internal and External Supply Chains. *Regional Science Perspectives in Economic Analysis*. Edited by M.L. Lahr and R.E. Miller. New York: Elsevier.
- Polenske, Karen R. 2003. Clustering in Space versus Dispersing over Space: Agglomeration versus Dispersal Economies, *Innovation, Entrepreneurship, Regional Development, and Public Policy in the Emerging Digital Economy*. Trollhätten, Sweden.
- Polenske, Karen R. 2004. Competition, Collaboration, and Cooperation: An Uneasy Triangle in Networks of Firms and Regions. *Regional Studies*. 38(9): 1029-1043.
- Porter, Michael E. 1998. *On Competition*. Cambridge, MA: A Harvard Business School Review Book.
- Porter, Michael E. 2001. Regions and the New Economics of Competition. *Global City-Regions*. edited by Allen J. Scott. New York: Oxford University Press: 139-157.
- Rosenfeld, Stuart A. February 1997a. Bringing Business Clusters into the Mainstream of Economic Development. *European Planning Studies*. 5(1): 3-21
- Rosenfeld, Stuart A. February 1997b. Exports, Competitiveness, and Synergy in Appalachian Industry Clusters. <http://www.arc.gov/index.do?nodeId=2574> (accessed April 3, 2005).
- Rosenfeld, Stuart A. 1999. Clusters in Rural Areas: Auto Supply Chains in Tennessee and Houseboat manufacturers in Kentucky. A Report for the Tennessee Valley Authority Rural Studies. <http://www.rtsinc.org/publications/TVAClusters.pdf%20copy> (accessed April 7, 2005).
- Rosenfeld, Stuart A. 2001. Networks and Clusters: The Yin and Yang of Rural Development. A report to the Federal Reserve Bank of Kansas City. <http://www.rtsinc.org/publications.html> (accessed April 3, 2005).
- Rosenfeld, Stuart A. 2002. A Governor's Guide to Cluster-Based Economic Development. http://www.nga.org/center/divisions/1,1188,C_ISSUE_BRIEF^D_4063,00.html (accessed April 3, 2005).
- Rosenfeld, Stuart A. 2004. Clusters and Competencies: Workforce Development and South Carolina's Economy: A report to the South Carolina Policy Council. <http://www.rtsinc.org/publications/SCReport.pdf> (accessed April 7, 2005).

- RTS (Regional Technology Strategies, Inc). 2001. Skills and Workforce Development for Mississippi's CIT Cluster: A report to the Mississippi Development Authority.
- Saxenian, AnnaLee. 1994. *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*. Cambridge, MA: Harvard University Press.
- Scott, Allen J. 1998. *Regions and the World Economy*, New York, Oxford University Press: 47-73.
- Storper, Michael and Richard Walker. 1989. *The Capitalist Imperative: Territory, Technology, and Industrial Growth*. Oxford, UK: Basil Blackwell: 70-124.
- Storper, Michael and Anthony J. Venables. June 2002. Buzz: The Economic Force of the City. Paper presented at the DRUID Summer Conference on “Industrial Dynamics of the New and Old Economy—Who is embracing whom?”
- Teubal, Morris, Tamar Yinnon, and Ehud Zuscovitch. 1991. Networks and Market Creation. *Research Policy*. 20 (5): 381-392.
- Wells, Louis T. Jr. (ed.) 1972. *The Product Life Cycle and International Trade*. Boston: Division of Research, Graduate School of Business Administration, Harvard University.

WHITE PAPER

ASSET-BASED DEVELOPMENT

March 30, 2005

Massachusetts Institute of Technology
Department of Urban Studies and Planning
Multiregional Planning Research Group
Cambridge, MA 02139

I. Introduction

Asset-based economic development refers to development strategies based on the natural and human-made tangible and intangible assets of an area. According to Anne B. Pope, the Federal Co-Chair of ARC, “asset-based economic development is about taking what you already have and maximizing its potential.” Asset-based economic development practices have been implemented in communities throughout Appalachia since the 1960s. The Appalachian Regional Commission has defined assets as the natural, cultural, and structural assets, and “the hospitality, work ethic and can-do attitude of its residents.” (ARC report 2004) In this whitepaper, we discuss the following types of asset-based development in the ARC region: education-based, entrepreneurship-based, resource-based, culture-based, and natural-amenity-based development.

II. Definitions and Drivers

As a first step in studying asset-based economic development, we use Ricardo’s comparative advantage theory, with Marshall’s “industrial district” and Porter’s cluster theories as further developments in a second step. We then include some of the latest economic-geography studies on asset-based development, much of which is being implemented in Europe, as a third step (Polenske 2001). The cultivation of entrepreneurship, social-capital formation, and local-knowledge spillovers are the overarching drivers for asset-based growth. Below we discuss each of these five subtypes in terms of their definition, growth drivers, and growth processes.

Education-based development³: Education institutions contribute to economic development through “research, creation of human capital through teaching, technology development and transfer, and co-production of a favorable milieu.” (Goldstein and Renault 2004) According to their research, among these drivers, the spillover of university research and technology creation contributes most to regional economic development. As we have discussed in our county-typology memo (Task 1, Part 3), we need to distinguish two types of education assets-based counties: (1) counties that are the sources of well-educated people due to the location of universities, and (2) counties that absorb well-educated people in their labor market. The discussion of this subtype is closely related to the issues we discuss in the learning-economy white paper.

Entrepreneurship-based development: In a market with perfect information, entrepreneurship would not be necessary. In less developed areas, entrepreneurship contributes to development through overcoming uncertainties, factor-market imperfections, and externalities by individual initiatives and skills. (Leff 1979) The key drivers of entrepreneurship-based development include the overall quality of human resources in the area, the cultivation of an entrepreneurial culture, the establishment of property rights to protect profits gained from entrepreneurial activities, and the establishment of supporting institutions, such as financial agencies targeting small businesses.

Natural-amenity-based development: Kusmin et al. (1996) indicate that traditionally, there is evidence that natural amenities are a factor contributing to population and employment change,

³ For more details on education-based development, please refer to RTS Whitepaper – Learning-based Economy. Here we include education-based development for the conceptual integrity of asset-based development.

hence regional economic development, in the United States. In the 1990s, the Economic Research Service (ERS) staff of the U.S. Department of Agriculture (USDA) conducted two studies, including a literature review and an empirical study to investigate factors that may have affected rural economic growth in the 1980s (Aldrich and Kusmin 1997). In the literature review, they identified temperature and precipitation as the two major factors facilitating rural economic growth, but we have some question concerning the relevance of these two factors for Appalachia.

Culture-based development: Pratt (1997) defines cultural industries as products, performance, in the form of fine art and literature; their reproduction, as books, magazines, TV and radio programs, recordings and etc., and activities that link together art forms such as advertising. He includes also the production, distribution, and display processes of printing, and broadcasting, as well as museums, libraries, theatres, night clubs, and galleries. Andersson (1985) argues that there six key drivers to the growth of cultural industries, including (1) a sound financial basis, but without tight regulation; (2) basic original knowledge and competence; (3) an imbalance between need for cultural products and their actual provision as the new environment calls for new cultural products; (4) a diverse milieu; (5) good internal and external possibilities for personal transport and communications, and (6) an uncertainty about the future, which calls for creative change. In his overview article, Sir Peter Hall (1997) reviews Pratt, Andersson, and other analysts' work and stresses the importance of initial wealth effects and the randomness of the development.

Resource-based development: Resource-based development refers to economic development based on natural resources, often with an underlying theoretical basis of comparative advantage. However, natural endowments are sometimes regarded as a "curse" for long-term development. Economists name this phenomenon as the "Dutch disease." Namely, the deindustrialization of a nation's economy that occurs when the discovery of a natural resource raises the value of that nation's currency, making manufactured goods less competitive with other nations, increasing imports and decreasing exports. On the other hand, the experiences of highly industrialized economies, such as Sweden and Finland, suggest that promoting clusters of "sidestream" and "downstream" activities can assist in achieving national development goals in terms of economic diversification and increasing the well-being of the population (Walker and Jourdan 2003).

III. Theoretical Foundation and Measurements

An asset-based strategy may have different effects on the economic upgrading of a region depending on the asset types. Tangible assets, such as coal or timber, may accelerate economic development only for a short period of time, but the development may not be sustainable, as shown by history in the Appalachian Region. However, smart use of the tangible assets can lift the region through the early growth stages and facilitate more sustainable growth if careful use is made of intangible assets, such as education or entrepreneurship. These intangible assets may be difficult to establish on a sustainable basis, but they are the backbone of healthy long-term economic development and link closely to the learning-economy approach to development used in a number of northern European communities (Asheim 1996).

An analyst can view an asset-based growth strategy as complementary to other growth strategies, and it often serves as a base for other development strategies. For example, the agglomeration of

firms of a certain industry in a place is often decided by the availability of the labor force, which is highly related to educational requirements. In certain types of manufacturing industries may seek locations with lower-skilled workforce to avoid a wage premium. Another example is tourism: natural assets such as climate, topology, local culture, and geographic locations serve as a foundation for higher-level development strategies. In an environment of high bio-diversity, an eco-tourism development strategy is more feasible than otherwise.

In terms of methods analysts use to measure the presence or maturity of asset-based growth patterns related to tangible assets, they often use many variations of the input-output analysis and the economic-base analysis, including mix-and-share analysis and location quotients (Broadberry 1998; OhUallachain 1991; Riefler 1979). We think that the Smirov-Smirova (2000) unpublished report is one of the important starting points for our measurements as well as the horizontal-clustering location-quotient (HCLQ) measure put forth by Fingleton et al. (2004). In the case of some intangible assets, such as entrepreneurship or culture, case studies, e.g. asset-mapping, can be the first step to investigate the presence of such assets.

Researchers can conduct multiplier analyses for regional development planning, but they must interpret the results of such calculations cautiously. As an example, they should not necessarily encourage the sector with the largest direct economic impact to expand in a region for several reasons, including that the benefits may not be retained in the local area, large multipliers for a sector do not always imply a large multiplier for subindustries within a sector, and there are often significant differences between the employment, income, and output multiplier effects for a given industry in a given region (Miernyk et al., 1970; Schaeffer 1998; Smirov-Smirova 2000).

IV. Natural-Amenity-Based Development: the Retirement Industry

Asset-based development is a development strategy with wide applicability. Basically, using it, policy-makers start from within the economy, understanding and cultivating the local strengths. An especially important development in recent years has been the natural-amenity-based development. The retirement industry is based on local amenities, but it usually has a low intensity of use of natural resources. The migrant retirees spend locally, and the income usually circulates within the local area. The spending also has a direct impact on high job-creating industries, such as hospitality, construction, and health care. For example, as the top retiree destination Florida, mature residents, while making up one-third of the state's population, account for about one-half of all income and consumer spending (The Destination Florida Commission 2002).

Although the retirement industry already began to gain favor among regional planners during the late 1980s and the early 1990s, its significance is likely to increase markedly in the future when the baby-boom generation retires. In 1995, the U.S. Census projected that 25 million people (pre-boomers) were in the 50-59 group who are currently planning retirement, among whom 17 to 38 percent may move from their home states to retire (Reeder 1998). This would represent a large and growing market for retirement destinations.

Researchers have identified both advantages and disadvantages of the retirement industry to local communities. On the one hand, according to the USDA research, the retirement industry

manifests its benefits by “population growth, increased family incomes, greater economic diversification, and reduced unemployment rates.” Contrasting sharply with income stagnation or decline in most other rural areas in the 1980s, the median income in rural retirement-destination counties (15% or more net immigration of those age 60 and over) increased by 4 %. On the other hand, not all retiree impacts are positive. Retiree attractions can result in undesirable congestion and environmental strain and drive up housing prices and property taxes. Many of the jobs created by retirees are low-wage service jobs, and retirees may require more of the public health services, which drains local public-financial resources. (Reeder 1998)

Many states have been actively promoting the retirement industry, adopting a wide variety of strategies. In Alabama, the State government has been an active agent for attracting retirees, including State marketing and retiree-related development investments. In Arkansas, the private sector, like real-estate associations, has taken the lead in developing a comprehensive attraction strategy. In South Carolina, new residential developments, including planned retirement communities, play a major role in attracting retirees. In North Dakota, the focus is on attracting former residents back into the community and filling existing vacant housing. In Washington, the state chose the relatively inexpensive community self-help model. For example, Chelewah, population 2000, attracted 150 new residents, most of them retirees, in one year with a \$10,000 promotion budget of distributing brochures and making videos. The marketing methods also vary from integration through tourism (North Carolina), to traditional marketing media, like newspapers, magazines, television, and radio (Alabama), financial incentives like tax breaks (Michigan and Mississippi), and even word-of-mouth advertising (Idaho and North Dakota). (Reeder 1998)

As summarized by Longino et al. (2005), there are three typical motivators behind the phenomenon of retiree migration: (a) move to warmer weather; (b) move down the metropolitan hierarchy to smaller cities and towns; and (c) move from higher to lower cost-of-living areas. Retirement migration has historically been concentrated in a relatively few states, but it has a tendency of spreading out to other locations. The ARC regional policy makers could consider building on local assets and developing amenity-based retiree centers as one of the major economic-growth strategies. They are facing three key challenges: first, how to formulate a unique positioning to win in an increasingly competitive retiree market; second, a related point, how to combine human-made amenities with the natural amenities to make the latter even more attractive; third, how to weigh the long-term economic and environmental impacts of the retiree industry into the short-term revenue gain, especially the impact of a plethora of low-paying service jobs.

V. Resource Extraction

One of the potential big traps in asset-based development is resource extraction in the name of competitive advantage, which can result in local poverty and boom-and-bust cycles. There are two issues here: the local multiplier of the ensuing development and overspecialization of the economy.

In terms of the local multiplier of the industry, the development of the coal industry in the ARC region is a good case example. Ms. Duncan concluded in her book (Duncan 1992) that although

the result of fierce competition in the coal industry was cheap energy to fuel industrialization in the Northeast and Midwest, the costs were severe for miners and their families. She wrote,

When coal mining began in the ARC region in the late 1880s, politicians and industrialists claimed that coal development would bring wealth and prosperity to the region. But these claims were not borne out. The coal industry did not bring improved conditions to the mountains, and even when production was expanding, times were hard in coal communities. Since coal reserves were geographically dispersed and widely available, and required relatively little capital to mine, it was easy to enter the business. The result was constant overcapacity, overproduction, and fierce competition. Operators were oriented toward short-term gain, and profitable mining was only possible if costs were held at an absolute minimum. Thus, wages were kept low, and companies made only minimal investments in coal-camp infrastructure. In 1937 Justice William Douglas observed that “labor and capital alike were the victims. Financial distress among the operators and acute poverty among miners prevailed during periods of prosperity” (quoted in Balliett 1978:28). (Duncan 1992: 114-115)

In the new millennium, with the rising oil price, the hope of profiting from coal has resurfaced. At least 94 coal-fired electric power plants—with the capacity to power 62 million American homes—are now planned across 36 states. One industry observer commented that “the situation has changed 180 degrees in the last year, so that we're almost back to the point where we were in the 1970s with a slew of coal-fired plants on the drawing board.” (The Christian Science Monitor 2004) Currently, Eastern spot prices for coal are hitting peak levels. Some urgent buying of Eastern compliance coal on the spot market can run \$65 per ton, compared with the mid-\$20 range of a few years ago. Alan Stagg, head of the West Virginia-based Stagg Resource Consultants, said that the current situation reminded him of the coal boom of 1974. He also remembers that it took decades to wring out the excess mine capacity that came online and cure many of the bad habits that resulted from that brief boom period. Stagg told the EUCI (Electric Utility Consultants Inc.) conference on volatile coal markets that he sees many parallels between then and now. (Power Daily, 2005)

With the current reentry of investors into the mining industry in the Appalachian region, policy makers need to evaluate the costs and benefits of the mining industry to the health of local economy, especially in terms of overall stability and the portion of benefit accruing to the local communities. In the next phase of development, the Appalachian region needs to think carefully about how to build a strong, diversified, and resilient economy based on local-assets with the local communities as the chief beneficiary. Coal and timber, undoubtedly, could play an important role in this development phase, but as policy makers design development strategies, they should emphasize ways in which the change and/or expansion of these sectors can help the region grow as well as become sustainable.

VI. Asset-based Development and Recreation/Tourism Market Growth

In contrast to resource extraction, natural assets can also be utilized to develop a sustainable recreation and tourism sector. Conventionally, tourism builds on local natural assets, such as mountains and lakes; and plays an important role in economic development. The World Travel

and Tourism Council estimates that travel and tourism is now the world's largest generator of jobs. In 1995, the industry provided direct and indirect employment accounting for 10% of the global work force and providing one in every nine jobs. Tourism is labor-intensive and provides immediate employment opportunities. Many tourism activities are within the reach of the small operator. As many of the natural beauties are not located in the city centers, but in the rural areas, tourism allows rural peoples to share in the benefits of tourism development, promoting more balanced and sustainable forms of development.

Sustainable Tourism can be defined as the means to "... meet the needs of present tourists and host regions while protecting and enhancing opportunities for the future. It is envisaged as leading to management of all resources in such a way that economic, social and aesthetic needs can be fulfilled while maintaining cultural integrity, essential ecological processes, biological diversity and life support systems." (World Tourism Organization 1988, quoted by UNEP Report 2002 P2) Among the many forms of sustainable tourism, Ecotourism is one of the most prominent in recent years. Ecotourism is defined as a form of tourism whereby tourists travel to destinations where natural environment (flora and fauna) and cultural heritage are the primary attractions. Ecotourism emphasizes the support of the local economy and its indigenous atmosphere and the preservation of entire local ecosystems and promotion of the importance of conserving nature.

Natural assets and tangible assets are not necessarily the determining factors in recreation/tourism industry development. The importance of cultural heritage cannot be neglected in the development process. In the Appalachian region, "Cultural tourism is the type of 'asset-based development' that can produce permanent jobs in the region, drawing on the region's music, history, environment and warmth of its people", according to Governor Mark R. Warner and Anne B. Pope, federal co-chair of the Appalachian Regional Commission. As a joint effort by National Geographic and the Appalachian Regional Commission in 2005, more than 350 of Appalachia's top cultural tourism destinations are featured on a color map. Local music and crafts industry are important components of the cultural tourism industry. One of the ARC states, Virginia, ranks in the top 10 states in the nation as a cultural tourism destination. Cultural tourism is growing twice as fast as traditional tourism, and cultural tourists tend to spend more than others. (Richmond Times-Dispatch 2005)

VII. Conclusion

From the discussion above, two important implications stand out for asset-based development: sustainability and local economy as the main beneficiary.

Sustainability refers to sustaining the asset-based economic development without over-extracting the local resources, resulting in environmental deterioration. The Appalachian Regional Commission put the philosophy of sustainable development in a witty way— "*to keep the goose that lays the golden egg healthy and productive.*" Success in asset-based economic development depends on long-term investment and a building-block process rather than a quick-fix approach. An important part of asset-based development is to build a foundation, such as infrastructure, for asset-based development and to enhance the local assets constantly instead of depleting them. (ARC 2004, Quotes from Section I)

More importantly, how much of the benefit of the economic development can be retained and circulated in the community. Two of the most useful indexes are the local income multiplier and the local employment multiplier. As our earlier analysis exemplifies that coal mine workers suffered from low income when the mining business prospered. More questions should be asked for the sake of the real benefit of the local people. What is the quality of the created jobs? Are the jobs created at the expense of existing local jobs? How much lead time is there before the development can take off from the date of investment? To what extent do the extra jobs trigger multiplier benefits elsewhere in the ARC region? We believe that the local planners must fully explore these questions before undertaking the asset-based development initiatives.

On the execution level, asset-based development has two levels of implications for local policy, the industrial development level and the community revitalization level (Polenske 2001). On the industrial development side, policies should promote innovation and the evolution of an industrial network based on an evaluation of local assets. Perroux (1988) illustrated this point clearly by defining a growth pole as a set of economic activities that has the capacity to induce the growth of another set of economic activities in an innovative way. On the community-side, policies should focus more on building, appreciating, and mobilizing individual and community talents, skills, and assets rather than focusing on problems and needs. Also, the development process is supposed to be led by the community rather than driven by external agencies.

Asset-based development strategy has the potential to be central to the Appalachian regional development as the area has rich natural, cultural, and human assets “sleeping” in the mountains. Through joint government-community initiatives in the region, there is a good chance that development will take off through the education-based, entrepreneurship-based, resource-based, culture-based, and natural-amenity-based processes in the new millennium.

REFERENCES

- Andersson, A. E. 1985. "Creativity and Regional Development." *Papers of the [Regional Science] Association*, 56: 5–20.
- Appalachian Regional Commission. 2004. "Appalachia: Turning Assets into Opportunities"
- Asheim, Björn T. 1996. "Industrial Districts as "Learning Regions": A Conduction for Prosperity." *European Planning Studies*, 4(4): 379-400.
- Broadberry, Stephen 1998 "How Did the United States and Germany Overtake Britain? A Sectoral Analysis of Comparative Productivity Levels, 1870-1990" *The Journal of Economic History* Vol. 58, No. 2, pp. 375-407
- Duncan, Cynthia M. 1992. "Persistent Poverty in Appalachia: Scarce Work and Rigid Stratification." in *Rural Poverty in America*, edited by Cynthia M. Duncan, Auburn House
- Fingleton, Bernard, Danilo Iglori, Barry Moore, and Raakhi Odedra, forthcoming. "Employment Growth and Clusters Dynamics of Creative Industries in Great Britain." In *Geographies of Innovation*, edited by Karen R. Polenske, publisher being selected)
- Global Philanthropy and Foundation Building
<http://www.synergos.org/globalphilanthropy/02/abcdoverview.htm>
- Goldstein H., and C. Renault 2004. "Contributions of Universities to Regional Economic Development: A Quasi-experimental Approach." *Regional Studies: The Journal of the Regional Studies Association*, 38 (7): 733 –746.
- Hall, Peter. 2000. "Creative Cities and Economic Development." *Urban Studies*, 37(4): 639–649
- Kusmin, Lorin, D. Kusmin, J.M. Redman, and David W. Sears. 1996. *Factors Associated with Rural Economic Growth: Lessons from the 1980s*. Economic Research Service, United States Department of Agriculture–TB 1850. USDA: Washington, DC.
- Leff, N. H. 1979. Entrepreneurship and Economic Development: The Problem Revisited. *Journal of Economic Literature*, 17: 46-64.
- Longino and Bradley. 2003. "A First Look at Retirement Migration Trends in 2000, *Gerontologist*" 43: 904-907.
- Miernyk W. H., Shellhammer, K. L., Brown, D. M., Coccari, R. L., Gallagher, C. J., Wineman, W. H. 1970. *Simulating Regional Economic Development*, Heath Lexington Books, D.C. Heath and Company, Lexington, Massachusetts.

- Mytelka, Lynn K. 2001. "Mergers, Acquisitions, and Inter-firm Technology Agreements in the Global Learning Economy," In *The Globalizing Learning Economy*, edited by Daniele Archibugi and Bengt-Åke Lundvall. Oxford, England: Oxford University Press:127-144.
- OhUallachain, Breandan; Neil Reid. (1991) "The Location and Growth of Business and Professional Services in American Metropolitan Areas, 1976-1986." *Annals of the Association of American Geographers*, Vol. 81, No. 2, pp. 254-270.
- Perroux, Francois. 1988. "The Pole of Development's New Place in a General Theory of Economic Activity" in B. Higgins and D. Savoie (Eds.), *Regional Economic Development: Essays in Honour of Francois Perroux*. Boston: Unwin Hyman
- Polenske, Karen R. 2001. "Taking Advantage of a Region's Competitive Assets: An Asset-Based Regional Economic-Development Strategy." *Entrepreneurship, Firm Growth, and Regional Development in the New Economic Geography. Trollhätten, Sweden: Uddevalla Symposium 2000: 527-544.*
- Power Daily. 2005. "Industry Veterans See Potential Repeat of Coal Boom and Bust Cycle", 25 February.
- Pratt, A. C. 1997. *The Cultural Industries Sector, Its Definition and Character from Secondary Sources on Employment and Trade, Britain 1984-91*. Research Papers on Environmental and Spatial Analysis NO.41, London School of Economics
- Reeder. R. J. 1998 "Retiree-Attraction Policies for Rural Development." Food and Rural Economics Division, Economic Research Service, U.S. Department of Agriculture. Agriculture Information Bulletin NO. 741.
- Richmond Times-Dispatch, 2005. National Geographic puts Appalachia on the Map, BY KATHERINE CALOS. March 22.
- Riefler, Roger F. 1979. "Nineteenth-Century Urbanization Patterns in the United States." *The Journal of Economic History*. Vol. 39, No. 4
- Schaffer, William A. 1998. *A Survey of Regional Economic Models*. Atlanta, GA: Georgia Institute of Technology: 48-83.
<http://www.rri.wvu.edu/WebBook/Schaffer/chap03.html#Heading25>
- Smirnov, Oleg, and Alena Smirnova. 2000. *An Assessment of the Economic Base of Distressed and Near-Distressed Counties in Appalachia: A Report to the Appalachian Regional Commission*. Washington, DC: Appalachia Regional Commission.
- The Christian Science Monitor. 2004 "America's New Coal Rush." February 24.
<http://www.csmonitor.com/2004/0226/p01s04-sten.html>

The Destination Florida Commission. 2002. Destination Florida Commission's final report with recommendations, <http://www.ccfj.net/DestFlaFinRep.html>

United Nations Environment Program. 2002. "International Year of Ecotourism 2002"

Walker M., and Jourdan P. 2003. "Resource-based Sustainable Development: An Alternative Approach to Industrialisation in South Africa" Minerals and Energy—Raw Materials Report, Routledge, part of the Taylor & Francis Group. 18(3)

WHITE PAPER

TRADE CENTERS

April 27, 2005

Ayman Ismail
aymanism@mit.edu

Massachusetts Institute of Technology
Department of Urban Studies and Planning
Multiregional Planning Research Group
Cambridge, MA 02139

WHITE PAPER

TRADE CENTERS

Introduction

Urban clusters (metropolitan and micropolitan areas) play a significant role in economic-development. They provide access to larger economies; they act as centers of trade, information, communication, finance, labor, business; and they could play a role as regional engines for economic-growth. In this paper, we examine the role of metropolitan and micropolitan centers as trade centers.

We define trade centers as the urban nucleus (metropolitan or micropolitan) in a county or group of counties that plays a central role in the region's economy and economic-growth. They typically have some of the key ingredients required, e.g., business and office space, distribution facilities, community colleges, retail outlets, and trained labor and professionals.

From an economic development viewpoint, the key questions that we answer in this paper are (1) how have trade centers evolved over time as urban centers of retail trade and services for a surrounding hinterland?; (2) what are the characteristics of a successful trade center?; and (3) how can existing trade centers be leveraged as an agent for economic development?

To answer these questions, we start by discussing the functional role of trade centers and defining them using census methodology for defining metropolitan and micropolitan urban areas and their role as trade centers in relationship to their surroundings. Then we draw on the economic development and economic geography literature and integrate multiple theories to explain the role of trade centers as growth engines, including theories of central place, economic-base, import-substitution, agglomeration and clustering, and supply-chain. We conclude by a synthesis of these theories, and a discussion of the potential role of trade centers in Appalachia.

I. Metropolitan and Micropolitan Areas as Trade Centers

Major and minor trade centers have existed since the dawn of history, and their economic role has been extensively analyzed by urban geographers, e.g., in the central place theory (Hoover 1975). The current census definition of metropolitan and micropolitan statistical areas offers a consistent way of identifying trade centers, and a useful explanation of trade centers' functional role. In this section we discuss the functional role of trade centers, then we define metropolitan and micropolitan areas based on the Census Bureau definition, and examine two concepts that affect their role as trade centers; the multiplier effect and the urban influence.

1.1 The Functional Role of Trade Centers

Before discussing the formal statistical census definition of metropolitan and micropolitan areas, we review the functional role of trade centers with respect to their surrounding. First, we discuss three definitional questions: (1) what functionally makes a trade center, (2) what are the hierarchies of trade centers and their roles, and (3) what are the complementary roles of other adjacent, proximate or otherwise interacting activity centers.

The concept of trade centers is based on the highly simplified central-place model of Christaller and Lösch. The central-place model examines the interaction between a rural region that is dependant on activities requiring extensive land use, e.g., agriculture or mining, and an urban center that has significant economies of agglomeration, and is based on activities requiring higher density, e.g., trade or industry (Hoover 1997, Krugman 1995).

Urban geographers identified typical geometric patterns that describe the way trade centers form with respect to the surrounding rural regions. They also defined hierarchies of trade centers that range from small towns that serve a rural surrounding, to a larger city that serves a group of small surrounding towns, and so on. These hierarchies are influenced by three basic factors: transportation costs, market density, and scale or agglomeration economies (Hoover 1975). Most of these factors are based on an agrarian or industrial economy where the economy's equilibrium is determined around the optimum physical delivery of goods from their origin to their final consumers. However, different patterns may evolve as a result of the current service economy, e.g., higher sprawl of urban activities. New factors may affect the evolution of trade centers, their distribution over space, and their functional role, e.g., the globalization of markets and the role of exports in economic development (see our later discussion of economic-base and import-substitution theories), and agglomeration and dispersion, including supply-chain theories.

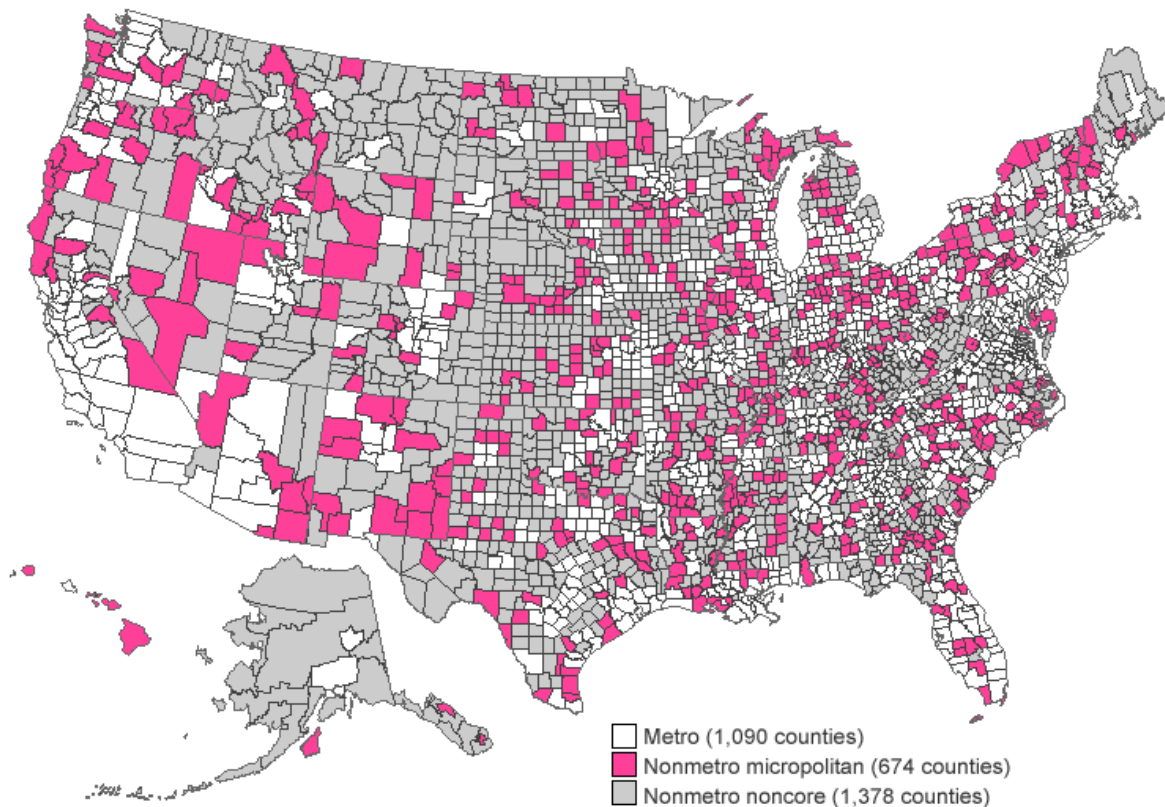
Based on these theories, we suggest that a trade center performs a critical functional role to its rural surrounding. Hoover (1975, p. 129) illustrates a hierarchy of services that are typically performed by trade centers depending on their size and position in the hierarchy, and ranging from the "convenience services" to the "primary wholesale-retail" services. This hierarchical model may be extrapolated to other types of services, e.g., financial services ranging from a small bank branch, to a full banking service; or to educational institutions ranging from a primary school to a large regional university with research capabilities. However, the distribution and hierarchy of trade centers may have evolved from the simple "transportation-dependant" model that is based on proximity, to a more complicated model that incorporates the effects of services and technology (e.g., call centers scattered over space with no transportation cost and low investment requirements).

In the remaining part of this section, we discuss the formal definition of metropolitan and micropolitan statistical areas, and their role as trade centers. Then, we provide a detailed discussion of the different theoretical underpinnings of trade centers, e.g., agglomeration and dispersion, especially supply-chain, theories.

1.2 Definition of Metropolitan and Micropolitan Areas

The Census Bureau classifies all counties in the United States into three broad statistical categories based on their level of urbanization; metropolitan, micropolitan and rural (non-core). The basic concept of a metropolitan area and a micropolitan area is that of an area containing a significant urbanized population nucleus and adjacent communities that have a high degree of integration with that nucleus. The Census Bureau defines these in specific statistical parameters, which we examine later in this section. This concept has remained essentially the same since metropolitan areas were first defined before the 1950 census. This concept of a metropolitan and micropolitan area provides a nationally consistent definition for collecting, tabulating, and publishing federal statistics (ERS 2005).

Figure 1: Metropolitan, micropolitan, and noncore counties, 2003.



Source: Economic Research Services, U.S. Department of Agriculture, using data from the Census Bureau. <http://www.ers.usda.gov/Briefing/Rurality/MicropolitanAreas>

Although the metropolitan and micropolitan statistical-area concept continues to represent an economically integrated area, how the Census Bureau measures integration has evolved as the relationship between settlement form and function changed, and as data sources and technology evolved (ERS 2005):

- Prior to 1950, the Census Bureau defined metropolitan districts using population density for county subdivisions. They measured functional integration in terms of telephone call patterns.
- With the introduction of the place-of-work question on the 1960 census, they replaced telephone call patterns with daily commuting patterns as a measure of social and economic linkages between central counties and potential outlying counties.
- The 1990 and earlier standards required analysts to use other structural measures of “metropolitan character,” in addition to commuting, to determine the geographic reach of a metropolitan area. These metropolitan character measures included levels of population density and percentage of population in urban settlements.
- Starting in 2000, the Census Bureau stopped using these “metropolitan-character” measures, and relied only on functional-integration measures, provided by the commuting patterns, to determine the geographic extent of the metropolitan areas. They also introduced the new concept of “micropolitan area.”

In addition to the above evolution, the Census Bureau investigated the feasibility of using measures as potential indicators of metropolitan and micropolitan areas (ERS 2005), e.g.,

- Commodity-flow data from the Commodity Flow Survey⁴ as a measure of economic linkages among areas with low levels of inter-county commuting.
- Shopping and recreational activity patterns (in addition to journey-to-work).
- Internet and telecommunication usage patterns for determining the increasingly important “virtual” social and economic linkages.

The 2000 census defines metropolitan and micropolitan areas as “core based statistical areas” (CBSA). Each metropolitan statistical area must have at least one urbanized area of 50,000 or more inhabitants. Each micropolitan statistical area must have at least one urban cluster of at least 10,000 but less than 50,000 inhabitants. A county (or counties) in which at least 50 percent of the population resides within urban areas of 10,000 or more population, or that contain at least 5,000 people residing within a single urban area of 10,000 or more population, is identified as a “central county” (counties). Additional “outlying counties” are included in the CBSA if they meet specified requirements of commuting to or from the central counties. As of 2000, there are 362 metropolitan areas and 560 micropolitan areas in the United States (Census Bureau 2005).

1.3 The Multiplier Effect of Trade Centers

The current definition of metropolitan and micropolitan areas reflects their linkages with the adjacent areas in the form of labor commuting, commodity flows, and shopping and recreational activities. Each of these linkages has a “multiplier effect” on the adjacent regions.

For example, labor commuting to/from these centers to adjacent areas has a multiplier effect on the economy of the counties where the workers live. The size of the multiplier effect varies depending on the size of a region’s economy and the employment base, but analysts typically determine local multipliers of two or three (ERS 2005). Applying this multiplier of two or three

⁴ The Commodity Flow Survey is conducted by the Census Bureau on behalf of the Bureau of Transportation Statistics.

to the 25 percent minimum-commuting requirement implies that 50 to 75 percent of the income in the adjacent counties where workers reside is connected to the central economy of the metropolitan or micropolitan area. This could be a direct relationship, through commuting to jobs located in the central county, or an indirect relationship, through services provided to local residents whose jobs are in the central county.

We explore these multiplier effects through the literature on the economic-base theory and import-substitution theory in the next section.

1.4 Adjacency and the Urban Influence of Trade Centers

Geography matters in economic-development. A county’s geographic context has a significant effect on its economic-growth and development through its size and access to larger economies. This access to larger economies, which represent the centers of trade, information, education, communication, labor, and finance, enables a smaller economy to connect to national and international marketplaces. We explore these relationships through the supply-chain literature in the next section (ERS 2005).

The measurement of adjacency and urban influence is developed by ERS using a set of county-level, urban-influence categories. The 2003 urban-influence codes divide the 3,141 US counties into 12 groups based on their urbanization (large/small metropolitan, micropolitan, or noncore) and adjacency to large/small metropolitan, micropolitan, or none (Table 1).

The urban influence codes define proximity based on physical adjacency. For example, there are 15 micropolitan areas that are adjacent to a large metropolitan area in Appalachia, with a total population of more than 1 million (~70 thousand inhabitants per town). Due to their location, it is likely that these trade centers’ economies are linked with the larger adjacent metropolitan area. In using these trade centers as triggers for economic growth to their surroundings, we can emphasize their functional and economic relationship with the larger metropolitan city.

The urban influence codes also define 24 smaller micropolitan areas that are not adjacent to a large metropolitan area. They have a total population of ~ 900 thousand inhabitants (~37 thousand inhabitants per town). These trade centers are not connected through geographic proximity to the larger metropolitan cities, and they may fall lower in the hierarchy. Analysts should consider other factors that may contribute to their connectedness when thinking of an economic-development strategy. For example, are these trade centers part of a supply chain? Are they nodes on a major transportation route (highway, airport or river)? Or do they have any

Table 1: Urban Influence Codes, 2003.

United States	Appalachia
---------------	------------

Cod e	Description	Number of counties	Population (year 2000)	Population density (person per square mile)	Number of counties	Population (year 2000)	Population density (person per square mile)
Metropolitan counties:							
1	In large metro area of 1+ million residents	413	149,224,067	558	34	5,165,721	293
2	In small metro area of less than 1 million residents	676	83,355,873	132	106	8,976,146	182
Nonmetropolitan counties:							
3	Micropolitan adjacent to large metro	92	5,147,233	55	15	1,073,989	114
4	Noncore adjacent to large metro	123	2,364,159	27	17	437,490	52
5	Micropolitan adjacent to small metro	301	14,668,144	51	53	2,949,465	95
6	Noncore adjacent to small metro with own town	358	7,855,590	23	41	1,182,866	54
7	Noncore adjacent to small metro no own town	185	1,879,264	6	36	555,321	38
8	Micropolitan not adjacent to a metro area	282	9,139,821	27	24	890,688	78
9	Noncore adjacent to micro with own town	201	3,227,833	17	30	698,833	49
10	Noncore adjacent to micro with no own town	198	1,313,175	7	24	327,078	32
11	Noncore not adjacent to metro or micro with own town	138	2,247,189	5	8	296,661	62
12	Noncore not adjacent to metro or micro with no own town	174	999,558	4	22	271,984	35
Total		3,141	281,421,906	80	410	22,826,242	114

Source: Economic Research Services, U.S. Department of Agriculture.
<http://www.ers.usda.gov/briefing/rurality/UrbanInf/>. Calculations of Appalachia figures by the authors.

natural amenities that can be exploited? In our empirical analysis (Task 1 memos) we examine some of these alternative measures of proximity that may influence the role of a trade center in economic growth.

II. Theoretical Underpinnings of Trade Centers

In this section, we examine the role of metropolitan and micropolitan areas as trade center through four different theories that explain how a trade center interacts with the rest of the economy. We use the economic-base theory, import-substitution theory, theories of agglomeration and clustering, and the supply-chain theory. In our synthesis of these concepts, we may explain how trade centers influence the economy, and hence, how they may be used within the context of an economic-development strategy.

The economic-base and import-substitution theories explain the role of a trade center in providing the surrounding local/rural economy with access to larger markets outside of the region through trade relationships. Theories of agglomeration and supply chains illustrate two factors that influence the way trade centers locate in space, e.g., in central places, along major transportation routes, or across industrial supply chains (physical or virtual).

2.1 Economic-Base Theory

Economic-base theorists divide an economy into basic and non-basic sectors. A basic sector is composed of local businesses and firms that produce for export outside of the region and are entirely dependent on external factors. Analysts typically consider manufacturing and resource-oriented firms, like mining or logging, to be basic-sector firms because they usually export their products in response to national or international demands. The non-basic sector is composed of firms that operate and produce primarily for local consumption and are largely dependant on local business conditions. Analysts consider most local services, like retailers and restaurants, to be non-basic-sector firms. Economic-base theorists assume that all local economic activities can be classified as either basic or non-basic (Berry and Garrison 1958, Klosterman 1990, Blumenfeld 1955, Smirnov and Smirnova 2000).

According to the economic-base theory, the means of strengthening and growing the local economy is to develop and enhance the basic sector. They identify the basic sector as the “engine” of the local economy. Economic-base theorists assert that by developing firms that serve export markets, the local economy can reduce the impact of local economic cycles. In contrast, a local economy wholly dependent upon local factors will have great trouble responding to economic cycles. They explain how exports fuel the economic-growth of a region through “multiplier effects.” Revenues from exports trickle through the local economies as payments to local factors of production, land, labor, and capital. These, in turn, generate an economic multiplier in the form of a chain-reaction effect. Local industries buy inputs from local suppliers, which then pay local employees and buy further inputs from local suppliers, etc. Local industries pay salary or wages to local employees, who then buy local products, further stimulating local businesses, who pay their local employees, and so on. These multiplier effects are especially important in triggering economic-growth, especially when the local economy is not developed enough to constitute a strong local demand; “priming the pump” in Keynesian terms (Berry and Garrison 1958, Klosterman 1990).

Analysts measure the effect of the economic base on the local economy by using the economic-base multiplier, which is the ratio of total employment to basic employment in a certain year in a certain region (Klosterman 1990).

Economic-base theory provides an explanation of the role of metropolitan and micropolitan areas as trade centers in the development of adjacent areas. We argue that the linkages of small adjacent counties to a large metropolitan or micropolitan economy provides it with access to a large external market for “exports”. This market could be the local market in this adjacent urban region, or a national or international export market that is accessed through the network of firms and businesses in this area. In effect, the metropolitan or micropolitan area becomes an “export” market, or a channel to a larger export market for the small adjacent economy.

2.2 Import-substitution Theory

Import substitution is an economic-development strategy analysts often use in developing countries. Import substitution is when goods and services previously imported from outside a region (or not consumed at all due to the high import costs) are produced locally within the region (Huskey 1987). When used as a development strategy, it implies identifying a specific set of goods and services that local businesses and institutions plan to import, and that can be competitively produced or supplied by local businesses (Alberta Bureau of Economic-development and Tourism 1992). The strategy is often proposed by planners who associate it with economic-incentives programs targeted by economic-development agencies to help these emerging industries attain competitiveness.

In turn, import substitution gets its theoretical underpinnings from different areas, including economic-base theory and entrepreneurship theory.

Economic-base theory explains the role of basic (export) industries to the economic-growth of a region. By contrast, imports have the opposite effect on a local economy. They represent leakages from the system. As a region imports goods and services, rounds of spending are leaked outside the region, spending that could contribute to earnings and production of the region if it occurred in the region. By adopting import substitution, a planner acts to prevent this leakage and attempts to keep the multiplier effects within the region. According to this theory, the replacement of one dollar of imports with local products and services is as effective in generating regional economic-growth as the creation of one dollar of exports from the region (Blumenfeld 1955).

Import substitution is also supported by the entrepreneurship theory, which examines the question of how individual entrepreneurs stimulate regional development. Entrepreneurs act in situations of uncertainty to fill in gaps in the economic landscape, e.g., unmet consumer needs, unconnected markets, incomplete information, or uncertain market forces. They respond to consumer demands, connect markets, and reveal needs in the local economy that can be filled by local businesses. Local entrepreneurs often engage in import substitution by responding to local needs in the economy and locally providing the required products or services. In many cases,

what is needed to encourage import substitution is merely the creation of linkages among existing local suppliers and producers (Blumenfeld 1955, Grabowski 1994).

Similar to the economic-base theorists, import-substitution theorists emphasize the role of trade centers in local economic-growth. We argue that an adjacent large metropolitan or micropolitan area acting as a trade center could provide the size and scale that enables the growth of local industries that perform the import-substitution role. It could provide the market for those basic industries and provide the opportunities for the local entrepreneurs. A small rural county that is not adjacent to a trade center does not have the size or scale that allows for local entrepreneurs to create local industries that substitute for imports. We argue that adjacency to a larger trade center is a necessary, but not sufficient condition, to help trigger this process.

2.3 Theories of Agglomeration and Clustering

An industry cluster is a group of business enterprises and non-business organizations that benefit from belonging to the cluster by increasing their individual competitiveness. Binding the cluster together are “buyer-supplier relationships, or common technologies, common buyers or distribution channels, or common labor pools” (Enright 1996: 191). Clusters are ultimately based on individual firm economic maximization functions. However, cluster analysts also recognize the role of trust and cooperation among cluster firms. They define non-business organizations as “related and supporting institutions,” which are a critical element in the success of the cluster. These organizations may include industry associations, universities, technical and community colleges with specialized industrial programs, economic-development agencies, or government industrial-extension programs. Regional industry clusters are industry clusters that are concentrated geographically, where geographic proximity between member enterprises creates a competitive advantage for both the industry and region (Enright 1996).

Michael Porter (1990), through his publication of *The Competitive Advantage of Nations*, revives the policy interest in regional industry clusters as a source of national and regional competitive advantage. He identifies a key role for geographic proximity, which is largely consistent with the previous work by Isard and his colleagues (Isard 1956) on industrial-complex analyses as well as with a growing group of analysts who examine how interdependence between firms, industries, and public and quasi-public institutions affects innovation and growth in regional agglomerations. Porter also provides anecdotal evidence of theoretical research on the role of business externalities and spillovers in driving growth and innovation. Most of Porter’s analysis focuses on identifying the basic conditions behind the competitiveness of clusters.

Porter’s ideas are not without important antecedents. In the 1950s, Francois Perroux argued that to understand economic-growth and change, analysts need to focus on the role of “propulsive industries,” those industries that dominate other sectors because of their large size, considerable market power, and/or role as lead innovators. Propulsive industries, or even individual firms, represent poles of growth that might attract, focus, and direct other economic resources. Porter’s clusters are very similar to these constellations of suppliers, producers, and other economic actors (Darwent 1969, Perroux 1950).

The idea of why enterprises cluster in geographic space and how that influences regional economic-development finds its theoretical explanation in the literature in two basic theories: industrial location theory that builds on Weber and Hoover (1937), where the benefits are called agglomeration economies; and Marshall's analysis of external economies of scale and their presence in "industrial districts." In both cases, analysts refer to several sources of externalities to explain why firms cluster. For a detailed examination of economies of clustering and dispersal refer to the white paper for this project on "Clustering Versus Dispersing of Economic Activity in Appalachia."

Based on the theories of clustering and agglomeration that explain the externalities enjoyed through a competitive industry cluster, we argue that a metropolitan or micropolitan trade center may help a competitive industry to emerge by benefiting from the clustering externalities, economies of scale and well established links to national and international supply chains. Industries need this urban nucleus that could provide the basic elements required for a cluster to emerge. Clusters need the infrastructure that supports them (e.g., labor and transportation for a manufacturing industry, or research centers and universities for a hi-tech industry). They also need access to transportation, telecommunication, and other necessary infrastructure. All these elements need an existing trade center that could act as an incubator for this cluster. We argue that the existence of a trade center is a necessary, but not sufficient, condition for clusters to emerge.

2.4 Supply-Chain Theory

A supply chain is the network of producers, retailers, distributors, transporters, storage facilities and suppliers that participate in the production, delivery, assembly, and sale of a particular product. The supply-chain concept has its theoretical foundation in two sets of literature. First, the early regional development literature on industrial development and infrastructure planning, which deals with how firms make decisions on locating their activities based on the economies or diseconomies of dispersal over the supply chain. The second set of literature is based on logistics and supply-chain management in operations research, management and civil engineering, which deals with the optimization of the time and cost of managing the supply chain. (Polenske, 2001).

Supply-chain analysts highlight multiple examples of how supply-chain development is an important element in building the relationship between large firms and local companies. These include supply-chain linkages with overseas companies or original equipment manufacturers (OEMs), e.g., supplier certification, building better buyer/supplier links such as sub-contracting linkages and strategic alliances (DTI 2003).

The following case example illustrates how the embeddedness of a region in a supply chain can be an effective economic development tool.

As supply chains become more complex and involve a lot of technological and logistical relationships between firms (e.g., firms connecting their inventory management systems, or firms creating long term preferred supplier networks), it becomes important for a firm to be an

integrated part of an established supply chain. In this context, we can think of trade centers as being the nodes of this supply chain. These are the places where the infrastructure (roads, logistics), the supplier and producer firms, and the operations of the supply chain take place. Being in the proximity of these trade center (or, alternatively, in the proximity of major transportation hubs like ports) may help provide a firm with a competitive advantage, and accelerate its growth.

Case Example: Supply chain as an economic-development approach in France

”Mechanic Valley” in Midi Pyrénées is structured around the aerospace, automotive, and machine tools sectors in Aveyron, Corrèze and Lot and comprised of some 210 businesses and 14,000 employees. The area is one of cluster development projects in the region. The policy in this instance has been developed to encourage diversification and restructuring through supply-chain development. Large firms (such as the Aerospace company Ratier in Figeac) have been encouraged to develop within ‘industrial districts’ and rely on the local skills base of small and medium enterprises (SMEs). The French experience illustrates how spatial planning strategies can be used to help foster inter-firms links and to embed firms into the local economy. Particularly successful policies designed to encourage supply chain development in the Midi- Pyrénées has included:

- the development of business incubators providing logistical services (such as fax, photocopying and high speed network connections) and low cost office and workshop space;
- exoneration from property tax for three years, which frees new businesses from one element of the tax burden;
- low levels of (local authority) property tax, which make one commune more attractive to businesses than another;
- the establishment of an ‘Economic-development Service’, which can range from simple information provision to companies wanting to move to the area to the organization of meetings and networks with outside companies and potential finance providers; and
- partial financing of development and information units in certain areas. These units have different objectives (assistance, putting together project proposals or grant aid bids, market potential studies, communication tools to promote the advantages and skill base of the local area).

Source: DTI 2003.

III. The Role of Trade Centers in Economic-growth

In the previous section, we presented an overview of four theories that represent the theoretical underpinnings of trade centers and their role as economic-growth engines. Here, we attempt to synthesize the key arguments made by these theories, and we follow by a discussion on the role of trade center in Appalachia, and potential policy implications.

3.1 Synthesis of the Theoretical Underpinnings of the Trade Centers Concept

Each of the four theories illustrate a different perspective on how a metropolitan and micropolitan area may act as a trade center, and their role as economic-growth engines, the key elements of which we summarize in Table 2.

Table 2: Summary of Theoretical Underpinnings of the Trade-Center Concept

Theory	Key arguments for Trade Centers
Economic Base	Linkages of small adjacent counties to a large metropolitan or micropolitan economy provide it with access to a large external market for “exports.” This market could be the local market in this adjacent urban region, or a national or international export market that is accessed through the network of firms and businesses in this area. In effect, the metropolitan or micropolitan area becomes an “export” market, or a channel to a larger export market for the small adjacent economy.
Import substitution	Import substitution emphasizes the role of trade centers in local economic-growth. An adjacent large metropolitan or micropolitan area acting as a trade center could provide the size and scale that enables the growth of local industries that perform the import substitution role. It could provide the market for those basic industries the opportunities for the local entrepreneurs. A small rural county that is not adjacent to a trade center does not have the size or scale that allows for local entrepreneurs to create local industries that substitute imports. Adjacency to a larger trade center is necessary, but not sufficient, to help trigger this process.
Agglomeration	A metropolitan or micropolitan trade center is necessary, but not sufficient, for a competitive industry to emerge. Industries need this urban nucleus that could provide the basic elements required for a cluster to emerge. Clusters need the infrastructure that supports them (e.g., labor and transportation for a manufacturing industry, or research centers and universities for a hi-tech industry). They also need access to transportation, telecommunication, and other necessary infrastructure. All these elements need an existing trade center that could act as an incubator for this cluster. We argue that the existence of a trade center is a necessary, but not sufficient, condition for clusters to emerge.
Supply Chain	Supply-chain development is an important element in building the relationship between large firms and local companies, including supply-chain linkages with overseas companies or OEMs, e.g., supplier certification, building better buyer/supplier links, such as sub-contracting linkages and strategic alliances.

Source: The authors.

3.2 Exploring the Implications for Appalachia

Based on the literature and our review of the four theories related to trade centers, we argue that proximity to a trade center provides the necessary, but not sufficient, conditions for small distressed counties. The role of this large trade center may take different forms; as an export market, a link to larger supply chains, or an incubator for an industry cluster. In all situations, strong linkages need to be established. These linkages can be in the form of physical transportation networks essential for the creation of integrated supply chains and trade; it can be through satellite campuses for larger universities that create linkages to regional research institutes; or it can be in the form of policies to encourage large regional firms to locate some of their facilities in the distressed region, creating a nucleus for an industry cluster.

By further examining the relationship between the urban influence and a county's economic status as defined by ARC (Table 3), we can illustrate the relationship between a trade center and economic development. 29 out of the 30 counties classified as "competitive" or "attainment" are in metropolitan or micropolitan urban area, with a clear bias towards metropolitan areas. "Transitional" counties are evenly spread across the three types of urban classifications. However, 75% of the "distressed" counties are in noncore rural areas.

Table 3: The relationship between trade centers (depicted by the Urban Influence Codes) and economic development.

Urban Influence Codes, aggregated (2003)	“Attainment” & “Competitive” Counties		“Transitional” Counties		“Distressed” Counties		Total Appalachia	
	Number of counties	Population (2000)	Number of counties	Population (2000)	Number of counties	Population (2000)	Number of counties	Population (2000)
								14,141,867
Metropolitan	26	5,229,995	104	8,552,415	10	359,457	140	7
Micropolitan	3	120,353	69	4,152,993	20	640,796	92	4,914,142
Noncore	1	18,324	86	1,965,980	91	1,785,929	178	3,770,233
				14,671,38				22,826,24
Grand Total	30	5,368,672	259	8	121	2,786,182	410	2

Source: The authors.

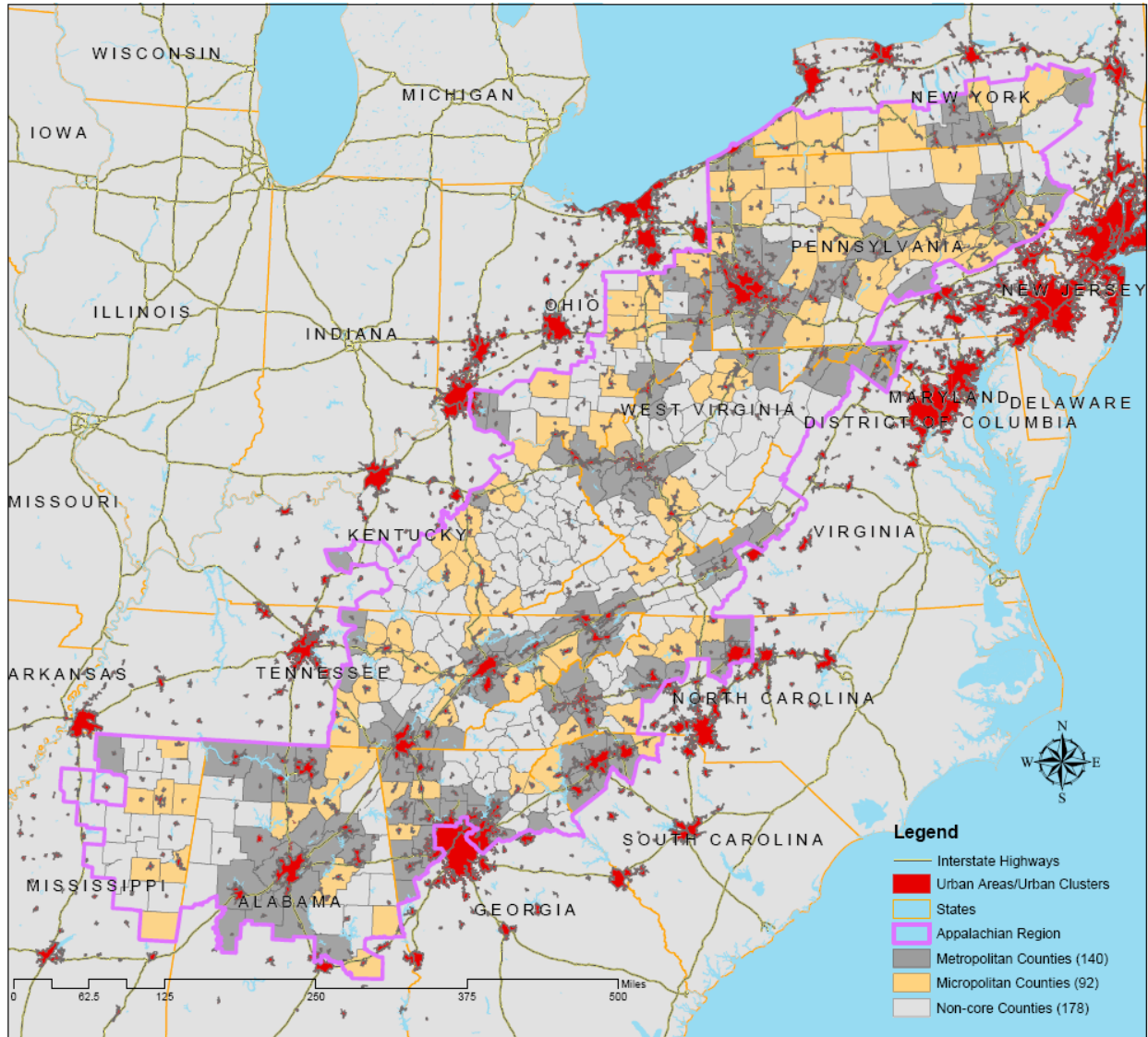
Data source: Economic Research Services, U.S. Department of Agriculture, 2003.

<http://www.ers.usda.gov/briefing/rurality/UrbanInf/>.

The clustering and dispersal economies, learning economies, and amenities-based development are covered in detail in other white papers. However, in this white paper we argue that to implement these economic-development strategies effectively, a distressed region needs to be physically and economically connected to a larger trade center that supports its growth and development. Based on Table 2, we may also argue that a trade center strategy may be more effective in transitional counties that are associated with metropolitan or micropolitan areas (173 counties, with a total population of 12.7 million).

This is a critical issue in Appalachia due to the geography of the region (Figure 2). Many of the counties have no adjacent urban trade center (metropolitan or micropolitan), and are not well connected to those centers through the transportation network. Most of these counties are the distressed ones. Some of factors behind this disconnectedness is the mountainous geography of the region. However, we argue that any future economic-development strategy for the region should focus on increasing this connectedness, despite the region’s geography. For example, an economic-development strategy that focuses on creating a local technical university or community center to induce industry clusters should create one that is linked to the larger universities in the region. A branch of a large university will be more effective in creating those linkages to the remote county than a small independent one. A similar approach can be taken for other development strategies, emphasizing connectedness to trade centers.

Figure 2: Metropolitan and micropolitan areas in and around the Appalachian region



Source: MIT Multiregional Planning Research Group.

Data Sources: 2004 Urban Influence Codes, Economic Research Services, U.S. Department of Agriculture; 2000 Cartographic Boundary Files, U.S. Census Bureau; 2004 National Highway Planning Network, Federal Highway Administration, U.S. Department of Transportation.

References

- Alberta Bureau of Economic-development and Tourism. 1992. *Communities on the Grow: Economic-development Bulletins*. Edmonton, Canada.
- Berry, Brian J. L. and William Garrison, 1958. "The Functional Bases of the Central Place Hierarchy," *Economic Geography*, 34 (1958), pp. 145-54.
- Blumenfeld, Hans. 1955. "The Economic Base of the Metropolis." *Journal of the American Institute of Planners*, Vol. 21, p. 114-32.
- Cromartie, J. and Linda Swanson, 1996. "Defining Metropolitan Areas and the Rural-Urban Continuum: A Comparison of Statistical Areas Based on County and Sub-county Geography." Washington, DC: Rural Development Perspectives, Vol. 11, No. 3, pp31-39, June 1996.
- DTI (U.K. Department of Trade and Industry). 2003. A Practical Guide to Cluster Development. <http://www.dti.gov.uk/clusters/ecotec-report/download.html> (accessed April 3, 2005).
- Economic Research Services (ERS), U.S. Department of Agriculture. "Measuring Rurality: Micropolitan Areas." <http://www.ers.usda.gov/Briefing/Rurality/MicropolitanAreas/> (accessed April 1, 2005).
- Economic Research Services (ERS), U.S. Department of Agriculture. "Measuring Rurality: Urban Influence Codes." <http://www.ers.usda.gov/briefing/rurality/UrbanInf/> (accessed April 1, 2005).
- Edward J. Feser and Malizia. Emil. 1999. Understanding local economic development. New Brunswick, NJ: Center for Urban Policy Research.
- Grabowski, Richard. 1994. "Import Substitution, Export Promotion, and the State in Economic-development." *Journal of Developing Areas*, Vol. 28, p. 535-54.
- Hoover, Edgar M. 1975. *An Introduction to Regional Economics*. New York: Alfred A. Knopf.
- Huskey, Lee. 1987. "Import Substitution in Frontier Regions." Ch. 3 in *Developing America's Northern Frontier*, ed. Lane, Theodore. Lanham, Maryland: University Press of America.
- Isard, Walter. 1956. *Location and Space Economy*. New York: John Willey & Sons.
- Isserman, Andrew M. 2005. "In the National Interest: Defining Rural Correctly in Research and Policy." Forthcoming in *International Regional Science Review*, October 2005.
- Klosterman, Richard E. 1990. *Community and Analysis Planning Techniques*. Savage, Maryland: Rowmand and Littlefield Publishers, Inc.
- Krugman, Paul. 1995. *Development, Geography, and Economic Theory*. Cambridge, MA: The MIT Press.

- Markusen, Ann R., Yong-Sook Lee, and Sean DiGiovanna (Ed.). 1999. *Second-Tier Cities: Rapid Growth beyond the Metropolis*. Minneapolis, MN: University of Minnesota Press.
- Norton R.D. and J. Rees. 1979. The Product Cycle and the Spatial Decentralization of American Manufacturing. *Regional Studies*. 13:141-151.
- Office of Management and Budget. 1998. "Alternative Approaches to Defining Metropolitan and Nonmetropolitan Areas," Federal Register, 63 (244): 70526-70561.
- Office of Management and Budget. 2000. "Standards for Defining Metropolitan and Micropolitan Statistical Areas," Federal Register, 65 (249): 82228-82238.
- Perroux, Francois. 1950. Economic Space, Theory and Application. *Quarterly Journal of Economics*. 64 (1): 89-104.
- Perroux, Francois. 1988. "The Pole of Development's New Place in a General Theory of Economic Activity" in B. Higgins and D. Savoie (Eds.), *Regional Economic Development: Essays in Honour of Francois Perroux*. Boston: Unwin Hyman
- Persky, J., Ranney, D., and Wiewel, W. 1993. "Import substitution and local economic-development." *Economic-development Quarterly*, Vol. 7, p. 18-29.
- Polenske, Karen. 2001. "Competitive Advantage of Regional Internal and External Supply Chains." In *Regional Science Perspectives in Economic Analysis*, Benjamin H. Stevens, edited by Michael L. Lahr and Ronald E. Miller, Amsterdam, The Netherlands: Elsevier Science, B.V., pp. 259-284.
- Polenske, Karen. 2003. Clustering in Space versus Dispersing over Space: Agglomeration versus Dispersal Economies, *Innovation, Entrepreneurship, Regional Development, and Public Policy in the Emerging Digital Economy*. Trollhatten, Sweden.
- Polenske, Karen. 2003. Clustering in Space versus Dispersing over Space: Agglomeration versus Dispersal Economies, *Innovation, Entrepreneurship, Regional Development, and Public Policy in the Emerging Digital Economy*. Trollhätten, Sweden.
- Porter, Michael. 1990. *The Competitive Advantage of Nations*. New York: The Free Press.
- Porter, Michael. 1996. "Competitive Advantage, Agglomeration Economies, and Regional Policy," *International Regional Science Review*, 19(1-2) (including comments by Ann Markusen and Porter's response): 85-94.
- Ratcliffe, Michael. "Creating Metropolitan and Micropolitan Statistical Areas." <http://srdc.msstate.edu/measuring/ratcliffe.pdf> (accessed April 1, 2005).
- Smirnov, Oleg, and Alena Smirnova. 2000. An Assessment of the Economic Base of Distressed and Near-Distressed Counties in Appalachia: A Report to the Appalachian Regional Commission. Washington, DC: Appalachia Regional Commission.
- United States Census Bureau. "About Metropolitan and Micropolitan Statistical Areas," <http://www.census.gov/population/www/estimates/aboutmetro.html> (accessed April 6, 2005).

US Census Bureau. "Metropolitan and Micropolitan Statistical Areas."
<http://www.census.gov/population/www/estimates/metroarea.html> (accessed April 1, 2005).

Williams, Colin C. 1994. "Local sourcing initiatives in West Yorkshire: an evaluation of their effectiveness." Ch. 2 in *Reinventing a Region*, ed. Haughton, Graham and Whitney, David. Aldershot, United Kingdom: Avebury.

White Paper

**Reassessing Firm Benefits of Clustering in light of
Globalization and Offshore Outsourcing**

ARC Clusters-Value Chains Whitepaper

Regional Technology Strategies

April 24, 2005

Clustering and Firm Behavior in Appalachia—Globalization, Agglomeration, and the Global Value Chains

What do the benefits to firms from clustering look like today in the midst of a period of rapid globalization that has seen the development of new industrial organizational forms designed to spatially cost-optimize manufacturing and innovation? And, if industry classifications are not useful in predicting what Appalachian manufacturing activities will survive subsequent rounds of globalization and offshore outsourcing, how can ARC identify the right kinds of investment targets to support development in the region?

This whitepaper is intended as one element of a comprehensive approach to the question “What are the industry-based or other factors that determine whether industries will (continue to) cluster or disperse, particularly among Appalachia’s key employment drivers.” The whitepaper attempts to:

- Outline the body of evidence from practice-based research regarding the benefits that are created for firms by operating in clustered business environments, particularly in less-densely populated regions.
- Examine this evidence in light of current globalization trends to highlight portions of our current understandings that may need to be revisited, both from research and the business press
- Introduce and review research from the Global Value Chains approach to changes in firm-level conditions that may have impacts on clustering behavior
- Explore refinements to the clusters model that can connect a set of key factors or pressures in global industries that either increase the importance of agglomeration or undercut the traditionally understood advantages of agglomeration.
- Draw some implications from this analysis regarding which types of clusters are more and less prone to dispersion based on local roles and position/function in global industry value chains.

The Context of Clusters

A Brief History of Clusters

Industry clusters have become one of the most common economic development concepts, and, according to some, the *sine qua non* of economic development in the past twenty years (Rosenfeld, 2001). With deep roots in Weberian location and agglomeration theory and the Marshallian notion of industrial districts, the industry clusters concept represents an evolution of

these two ideas that leapt to prominence in the early 1990s thanks to the attention of Michael Porter of Harvard Business School and others. This approach has influenced local, regional/state, and national economic development policy worldwide and added significant value as a method of understanding regional economies, as a tool for engaging industries in collective problem solving, and as a tool for organizing service delivery across public-sector departments, services, and functions (Waits, 2000). Though the advantages to regions of clusters are outside the scope of this discussion, clusters represent an attractive focus for economic development activities because they are invoked principally to describe the activities in which regions have developed specialized competencies and therefore are export-oriented, producing goods and services for sale outside of the region.

Definitions and Origins of Clusters

For the purpose of this paper, we define clusters broadly as *geographic concentrations of interrelated companies and institutions of sufficient scale to generate external economies*. Such concentrations typically include competitive firms and cooperating suppliers, service providers, and associated institutions that may do business with each other and share needs for common talent, technology and infrastructure. This definition addresses the major aspects and implications of clusters for the purposes of the Appalachian Regional Commission, though we acknowledge that arguments about and refinements to this definition are many.

Clusters are often, but need not necessarily be, defined around a specific industry, sector, input-output matrix, or industry supply chain. Some, such as semiconductors in Northern California, automobile in and around Detroit, and furniture in Northeast Mississippi fit neatly within NAICS or SIC-based definitions. Other clusters are based on process technologies, such as the firms that produce plastic goods in the Naugatuck Valley of Connecticut. The largest users of plastics technology and skills, however, are BIC, Schick, and Lego, none of which is classified as a plastics company. Still other interdependencies that define clusters include supply chains, core technologies, proximity to natural resources, or distribution channels. Rocha (2002), in fact, outlines seven different intersections of geographical, industrial, sectoral/inter-sectoral, and inter-organizational dimensions that have been used to create conceptual and operational definitions of clusters.

When mapping or representing clusters, the maps typically include firms in the core industries, suppliers of capital goods, direct inputs, and specialized services, as well as private-sector economic activities that are “induced” by the presence of core industries. They also tend to include associations or supporting institutions specific to the cluster, skill and education providers such as universities and community and technical colleges that contribute to the territory’s human capital stock, (and which may be public or private but are most frequently public institutions), and knowledge providers such as research institutions, technology diffusion organizations, and other providers of research and technology that are not exclusive providers to one or a small group of firms.

While an in-depth discussion of the origins of clusters is not within the scope of this work, it is important to note that few (if any) clusters have been “created” through policy or program interventions. Cluster formation and growth has tended to be an organic process with varying

degrees of influence of factors such as natural resources (raw material or energy supply) inputs, antecedent industries, “lead firms,” either headquarters or branch plants, and local or regional craft or skill traditions. More recently, greater attention has been given to clusters that are created or enhanced by the residential preferences of skilled professionals, creative and artistic communities, and entrepreneurs, (Kotkin, 2000) as well as indigenous craft skills and traditions. Some examples of dominant “reasons” that have motivated firms to cluster together appear below.

"Reason" For Cluster	Example Cluster(s)
Product	Hosiery, Catawba Valley, North Carolina
Process	Plastics, Naugatuck Valley, Connecticut
Industry Supply Chain	Auto suppliers, Central Kentucky
Company Supply Chain	Proctor & Gamble, Alexandria, Louisiana
Technologies	Optics & Imaging, Tucson, Arizona
Skills/talent	New Media, Manhattan
Resources	Log homes, Montana
Location/Infrastructure	Distribution: Hampton Roads, Virginia
Creativity	Writers, Livingston, Montana
Lifestyle	Software, Fairfield, Iowa

Firms may remain clustered in a region long after the initial “reason” for choosing this location has become irrelevant, largely due to the development of one or another form of special expertise over time (Enright, 2001). According to Feser et.al., “in their ideal form, clusters are essentially the empirical manifestation of the mutually reinforcing influences of first-mover effects, conventional business agglomeration economies, localized technology spillovers, and geographical path dependence” (Feser et. al. 2001).

Numerous state and regional studies in the US have explored the “family trees” of clusters to identify the process by which they have evolved and grown. The number and scope of businesses in a cluster typically results from spinoffs and company formation subsequent to layoffs. These include efforts by the UC-Connect in San Diego, Maryland’s TEDCO, and the National Commission on Entrepreneurship. In addition, the presence of a ready base of customers, suppliers, and knowledge also tends to provide a high degree of support new entrepreneurs, making entrepreneurial process, then, constitutes an important component of cluster growth.

Why Cluster? Benefits to Firms

Most discussion of the advantages of clustering are those related to agglomeration economics descending from Alfred Weber’s 1909 *classical location theory* formulation, and those descending from Alfred Marshall’s *industrial districts formulation*, which has evolved into a more comprehensive theory of sectorally-based regional advantage through numerous iterations and refinements. The dual tenants that firms benefit from clustering with like firms, suppliers, and related institutions (1) through *agglomeration economies or external economies of scale that reduce production, transportation, and coordination costs*, and (2) through soft economies of

learning and collaboration that speed innovation and product and process advancement (also Collective Efficiency)—have remained in tact through numerous iterations and refinements of cluster theory. The interplay of these two intellectual traditions comprise the core of cluster arguments which have been increasingly refined over time.

Hubert Schmitz has broken down Marshall’s term “collective efficiency” in ways that clarify the advantages of clusters (1997). He divides the value added into two parts, external economies, which are the unintentional advantages that are derived by companies due to achieving the necessary scale to attract suppliers, specialized services, and trained labor, and a sufficient scale to obtain these at a lower cost, and joint actions, which are deliberate acts of cooperation and collaboration that give companies strength of numbers to influence customers, markets, or policies. Camagni (1992) found in his research that current clusters create an innovative milieu, a “complex network of mainly informal social relationships...which enhance the local innovative capability through synergetic and collective learning.” (Rosenfeld, 2001)

A concise summary of the types of benefits that firms access through operating in clustered configurations considers both the “hard” economies related to cost factors stemming from agglomeration and “soft” economies that capture “higher order” dimensions related to learning and collective efficiency.

Advantages of Clustering

Type of Economies	Specific Factors Present	Benefits to Firms
“Hard” Economies Agglomeration	Supply Chains	Reduced transaction costs
	Labor Pools	Higher levels of experience
	Specialized Services	More options, lower costs
	R&D and Technology	Quicker adoption
	Capital	Increased availability
“Soft” Economies Collective Efficiency	Association	Collective influence
	Networking	Economies of scale, learning
	Tacit Learning	Innovation
	Knowledge Leaks	Imitation
	Labor Grapevines	Better employment opportunity

Of course, the line between these types of economies is somewhat fuzzy: specialized services may evolve due to the intentional or unintentional communication of multiple firms’ service needs, and it is often difficult to separate cost reduction and innovation when assessing why firms adopt new technologies or processes.

In recent years, these Marshallian “un-traded transactions”—learning and technology transfer among firms-- are theorized as being equally, and increasingly more, important advantages than the cost advantages implied by the agglomeration economies (Ludvall, 1992; cited in Rosenfeld, 2001).

Cluster Characteristics and Competitiveness

Soft economies in particular are claimed to permit clustered firms to respond more effectively to changes in product and market demands by drawing on the collective resources of the cluster to adapt to changes. In recent work on clusters and competitiveness, discussions of “Weberian” agglomeration economies are often neglected altogether in current cluster research, since they are considered most relevant to cost-based comparative (competitive) advantage which is widely seen as unsustainable in developed economies faced by international competition. Instead, cost issues are typically embedded in a number of other factors—competitive position, geographic span of sales, stage of development, and others. Enright (2001, 1998) provides twelve dimensions that are useful in describing clusters that covers most dimensions of clusters that are considered relevant to their “competitiveness:

Descriptive Factors Relevant to Cluster Competitiveness, from Enright, 2001

Dimension	Types	Subtypes
Geographic scope	Localized Dispersed	
Density Sheer number and economic “weight” of firms	Dense Sparse	
Breadth Range of horizontally related industries	Broad Narrow	
Activity Base Number and nature of activities in the value added chain in a region	Activity-Rich Activity-Poor	
Depth Range of vertically-related industries	Deep Shallow	
Geographic Span of Sales	Global Supranational Regional National Subnational Regional Local	
Strength of Competitive Position	World-leading Leading in int’l region National leader	Strong competitors Moderate competitors Weak competitors
Stage of Development	Embryonic Emerging Mature (Established)	Growing Stagnating Declining
Technological Activities	Generators Adapters Users	
Innovative Capacity Ability to generate key innovation relevant to competitive advantage in region	High Innovation Low Innovation	
Ownership Structure	Locally Owned Nationally Owned Foreign Owned Combination	
Industrial Organization Governance structures and relationships among firms in the cluster	Core-Ring with coordinating firm Core-Ring with lead firm All Ring, no Core All Core, No Ring	

Co-Ordination Mechanisms Organization of inter-firm relationships	Spot markets Short-term coalitions Long-Term Relationships Heirarchies	
--	---	--

Clusters in less favored and non-metropolitan regions

Clusters in non-metropolitan areas (and less favored regions in general) face specific challenges on a number of the dimensions outlined above. It is no secret that the nation’s rural manufacturing economy was largely seeded by branch plants seeking lower operating costs and contains many firms that suffer from isolation and less sophisticated management. When considered along Enright’s descriptive dimensions rural clusters are challenged by their low density, less advanced technology activities, lower innovative capacity, and limited activity base. Rosenfeld has written that the types of businesses that tend to clusters in less favored regions are inclined to rely more on cluster characteristics that reduce costs than on those that accelerate innovation and learning. The characteristics of many less-favored regions—low levels of educational attainment, weak schools, little investment capital, weak connections to external markets, and poor physical and support infrastructures—strongly favor those clusters that are low-tech, traditional industries, based more on imitation than innovation. *These clusters are very susceptible to global competition.* (Rosenfeld, 2001)

This appears to be particularly true in Appalachia. Bernard, et.al, (2004), present six conclusions regarding Appalachian industries’ vulnerability to imports. They cite (1) accelerating growth in trade with low-wage partners such as China and India, particularly in non-capital or technology intensive industries, (2) the associated high probability of plant closure, employment loss, and output reduction resulting from the arrival of low-wage imports for a given sector, (3) the concentration of Appalachian manufacturing employment and output in industries that are highly exposed to these imports resulting from the Appalachian industry’s lower skill intensiveness and productivity, (4) an observed “more pronounced” impact of low-wage imports on shutdowns of Appalachian manufacturing plants than on plants in other US regions, (5) the forecasted rapid increase of low-wage imports in the coming decade, and finally, (6) low rates of entry and exit of Appalachian manufacturing industries indicating a tendency to slower to adjust their product mix. (Bernard, et.al. 2004)

This phenomena is not unique to Appalachia or to non-metropolitan regions in the U.S.. Nearly all of the clusters that have been studied in less favored or less developed regions consist of companies that use low levels of technology and require skills that can be learned on the job, where barriers to and costs of entry are low, and that require little if any investment in research and development. An overview of the regions in the European Union categorized by its Social Fund as “less favored” characterizes them as having “sectoral specialization in traditional industries with little inclination for innovation and predominance of small family firms with weak links to external markets” (Landabaso, Oughton, and Morgan, 1999, Rosenfeld, 2001).

One bright spot for rural regions is that traded cluster employment “accounts for nearly identical equal shares of rural and metropolitan employment,” suggesting that rural regions are not entirely (proportionally) “out of the game.” In addition, it finds that six (of 41) “traded clusters” (as defined by Porter, 2005) account for 38.4% of traded employment in rural regions. These are:

Hospitality and Tourism, Food Processing, Heavy Construction Services, Automotive, Metal Manufacturing, and Business Services. Of these, at least three- Hospitality and Tourism, Food Processing, and Heavy Construction Services appear to be less vulnerable to foreign competition due to the market-serving dimensions of competitiveness. Furthermore, there are strategic and political dimensions of automotive manufacturing location that appear to offer some resistance to foreign competition. Citing research from USDA, the same literature review by Harvard ISC also suggested that some rural regions may also enjoy advantages in rapid “just-in-time” production and delivery in industries with a low share of labor in total costs, though this seemed to hold more for metro-adjacent rural areas. (Porter et.al., 2005.)

However, the same review found that even the traded clusters analyzed paid only 52.2% of traded wages in metropolitan regions—as compared to 67.8% for all sectors—and are experiencing lower wage growth, suggesting that the employment in these sectors is “relatively less advanced and productive than rural local employment.” (Porter et. al, 2005 p21)

Clusters practice has reflected an understanding of the acute needs of rural areas to develop advantages of clustering to remedy some of these deficits in competitive structure. Adoption of cluster (and, previously, network-based) programs have been substantial in rural areas because of the significant need for these regions to begin to develop non-cost-based competitive advantage, collective advantage being seen as a key to industry survival (Rosenfeld, Jacobs, and Liston, 2003).

Cluster Strategies

In clusters, economic development policy and program architects seemed to have found a very useful template for improving industry competitiveness in the late 20th and early 21st century “knowledge economy.” If regional economic growth depends on competitive advantage obtained from the cluster’s innovation, learning, collaboration (or, more accurately, “coopetition”), and if these advantages can be measured or described in terms of the dimensions of cluster competitiveness outlined by Enright, or some approximation thereof, then regional developers have a number of ready-made “targets for intervention” corresponding to different strengths and weaknesses of the cluster(s).

Without assessing their efficacy, we should note that the range of cluster-based or related interventions are diverse. Some of these are cluster-specific (Enright, 2001). For example, through investments in regional R&D capacity, regional manufacturing clusters that are technology users could be transformed into technology generators. Through manufacturing modernization programs and skills-training, low innovation clusters could become high innovation clusters. Through recruitment of specialized suppliers and services, shallow clusters could become deep clusters. Others are better described as “cluster-related” (Enright, 2001) A wide range of interventions designed to correct the defects of regional economic infrastructure could be justified based on their impact on the performance of specific regional industrial systems (clusters). Since the clusters approach represents the “state of the art” in economic development, states and regions have continued to rely on these tools, uneasily in some cases, in the early 2000s (Bayard, 2005).

Cluster Policies In Crisis

Yet, in the past several years, particularly since the turn of the last century, accelerated globalization has combined with restructuring of global manufacturing firms to produce rapid job loss in the United States' manufacturing sector. The popular press attributes much of this phenomenon to China's current ascendance as an industrial power, as a consumer marketplace, and as a low cost production platform (Engardio and Roberts, 2004). According to the US-China Economic and Security Commission's 2004 report, over 1.5 million jobs were shifted from the US to China in the 1989-2003 period.

For economic development professionals and researchers, the post-2001 period appears to be a "perfect storm" for the manufacturing sector. First, a jobless recovery from a brief recession of 2001-2002 has led US and global companies to restructure operations focused on cost saving and access to rapidly growing Asian markets (especially China). Second, increased per-worker productivity stemming from automation and technology have reduced employment growth in many sectors. Third, the ongoing state budget crisis and federal preoccupation with war in Iraq have limited the financial resources available among state and local governments to address industry competitiveness. In addition, the results of two decades of trade liberalization has hit some of the most vulnerable industries in the United States especially hard, with furniture, textiles, and other traditional manufacturing sectors that have been key employers in Appalachia impacts by low-cost competition from abroad, particularly where quota restrictions on imports have been lifted.

These factors, combined with projections of further shedding of manufacturing jobs in the US economy, have contributed to questions arising regarding the potential of industry cluster-based strategies to assist declining US industries (assuming, of course, that this approach ever held such potential). The benefits of clustering-- or operational/efficiency and innovation advantages accrued by U.S. companies operating in a geographically clustered configuration—appear to be overwhelmed by raw concerns of cost and market access, boding poorly for the Appalachian manufacturing employment situation. In this context, rural Appalachian manufacturing clusters, the characteristics of which are discussed in a previous section, are at risk. As Atkinson notes, **"In the new knowledge economy, two activities are taking place simultaneously. On the one hand, more routine work is either being automated or offshored. On the other hand, more jobs are being created in more complex functions that need to be near each other in order to thrive, adapt, and innovate"** (Atkinson, 2004 emphasis author's).

An Industry Clusters Approach may Provide Limited Understanding of Global Industry Organization and Strategy

An industry clusters approach offers many advantages and understandings that are useful for organizing economic development analysis and efforts, however, the approach is not without shortcomings. First, these approaches may be overly-focused on local production conditions (supply-side efficiencies) and perhaps not focused enough on the global market conditions, price structures, production strategies, and demand-driven requirements of the companies and industries that operate in the cluster (*we might also call this the production and demand contexts*). Tending to focus on generating the kinds of advantages that can be developed within the cluster, factors external to the clusters that influence firm choices about production strategies are often

considered outside of the span of control of interventions at the local and regional levels. It deserves mention that Markusen (1996) clearly articulated this limitation of the study of industrial districts and argued for an expanded awareness of the external linkages of these clusters. Hub and spoke districts, satellite industrial platforms, and state-anchored industrial districts were examined with respect to their linkages to the outside world. Markusen warned, “their success cannot be studied by focusing only on local institutions and behaviors, because their companies...workers...and other institutions...are embedded in external relationships—both cooperative and competitive—that condition their commitment to the locality and their success there.” (Markusen, 1996, p.309)

To the extent that cluster policies have been deployed with an awareness of international market conditions, they have focused (broadly) on export promotion. These efforts may not without a clear awareness of evolving global competencies among competing cluster/regions. A 1997 evaluation of Appalachian industry clusters’ export potential and competitiveness performed by RTS considered the internal dynamism of the cluster and the growth of foreign markets, but did not probe competitive issues such as the comparative cost landscape of overseas competitors or the global production strategies of competitors (RTS 1997). Lack of attention to global competitors and production strategies may have led to undue optimism around the export potential of the household furniture sector, which is, in fact, one of the most highly trade-impacted sectors in Appalachia.

Cluster strategies have been “practiced” with the assumption that incremental improvements in efficiencies and innovation can preserve higher value jobs in the face of global competition, an assumption which is debatable in the present context. This approach appears to be at the heart of the current questions regarding the relevance of this practice to Appalachian industry clusters, and to developed markets in general. *While focusing on the many benefits of collective advantage and innovation, the clusters field may have under-estimated both the importance and the rate of change in firm- and industry-based production strategies designed to reduce costs and optimize market access.* These strategies are increasingly resulting in the formation of offshore industries with their own (competing) agglomeration economies that may obviate the geographic advantages of even many of the most innovative US manufacturers by producing comparable or higher quality products at what appear to be significantly reduced costs. These new production strategies are also enabling the dispersion of particular types of innovation in new and more flexible ways that may require the re-thinking of assumptions about where innovation will “live” in the future. This too has consequences for the nature of competitive advantage for Appalachian clusters.

Today, firms and industries are distributing production across the global landscape in ways that cluster strategies cannot easily cope with. Numerous recent contributions to this understanding highlight new ways in which the “fragmented firm” distributes different (value chain) functions across the globe (Sommers and Carlson, 2003, Markusen, 1996). This has resulted from more sophisticated global production strategies enabled by information technology (Dicken, 2003), new and in some cases, more “modular” global production systems that spread the cost advantages of globalization to a wider range of companies and corporate partnerships (Sturgeon, 2002), and the concomitant structuring of global industry value chains in new and less geographically constrained ways (Gereffi and Sturgeon, 2004).

The next section is devoted to exploring evidence from recent research and business press in order to determine how some of the understood benefits to firms and resulting effects on firms' competitive advantage may have changed in recent years in ways that may enhance or undercut cluster-based understanding(s). This section considers three observations that may impact clusters' relevance in future regional policy.

1. Offshore outsourcing of manufacturing is growing, and production may be dispersing in the US, but is also re-agglomerating in offshore locations, particularly in China, and in "nearshore" locations such as Mexico
2. A new industrial organization form referred to as the Modular Production Network has emerged to permit coordination of more complicated production activities by more firms and in more industries
3. The "fragmented firm" has emerged from deverticalization in ways that tend to functionally distribute even higher-order functions across geographies. More diffuse technological and labor force capabilities allow fragmentation of innovation into a larger number of discrete "chunks," which are becoming easier to distribute.

1. Offshore Outsourcing and Agglomeration Abroad

Offshore Outsourcing Continues to Accelerate

Numerous recent reports from the business press and policy literature have declared the existence of a growing offshore outsourcing trend. In February 2003 and December, 2004, Business Week dedicated section to the difficulties US manufacturers face in confronting Chinese competition. The National Academy of Sciences Economics Division has convened an expert panel to explore the issue, and numerous policy meetings and publications have addressed the subject from a national and regional perspective (See Atkinson, 2004, Accelerator Group/Detroit Regional Chamber of Commerce, 2004, Gereffi & Sturgeon, 2004). Much of the renewed attention to offshore outsourcing of manufacturing can be attributed to the growing trend towards IT, engineering, and other business services outsourcing by US firms, which has for the first time appeared as a perceived "threat" to the white collar job base.

Recent evidence suggests that outsourcing and production shifting to low-cost offshore locations has expanded in depth and breadth as part of firms' systematic production cost optimization strategies. Broffenbrenner and Luce (2004) provide insight on production shifting in 2004 through rigorous tracking of US job losses due to global outsourcing. Their findings suggest several important conclusions. First, that US manufacturers systematically under-report the number of such jobs lost. Their research confirmed job losses of nearly 25,000 for January-March 2004 compared to only 4,633 reported to the US Bureau of Labor Statistics. Secondly, they found that the majority of US jobs lost are shifting to Mexico (140,000 in 2004) and China (85,000 jobs). Third, they found that a diverse cross-section of industries are shifting a broader range of manufacturing jobs to China than in their previous survey in 2001, and that these include not only lower value-added industries such as apparel and footwear, toys, etc. as in the past, but also sporting goods, wood and paper products, aerospace, appliances, household goods, industrial equipment and machinery, electronics and electronics equipment, chemicals, plastics,

glass, and rubber, among others. Finally, they concluded that these shifts represent systematic attempts by established multinational companies seeking to rationalize global production not only to serve growing markets in destination locations, but more importantly, to serve global (including US) markets more cost-effectively. In many cases, shifts from US locations are part of global strategies which involve multiple plant closings in North America, Western Europe, and Japan and new facility locations in multiple low-cost locations such as China, Mexico, and Eastern Europe. (Brofenbrenner and Luce, 2004).

A survey of 500 senior finance and human resources executives from manufacturing and related industries reported that “the percentage of jobs being shifted will roughly double during the next three years, with an average of 13% of jobs already relocated and an additional 12% at each company being considered for relocation (Purdum and Teresko, 2004). The same article quotes a Boston Consulting Group estimate of 30% (minimum) annual growth in US consumption of industrial goods sourced from low-cost countries

Agglomeration Economies Developing Abroad

There is good evidence that large-scale industrial agglomerations (and perhaps even clusters in the broader sense of the world) are developing apace in China, particularly in the prosperous eastern coastal provinces. In certain industries, these agglomerations are well-established, while in others, they are emerging from China’s current export-driven industrialization efforts. In this context, Chinese firms and firm networks appear to be poised to reap all of the cost-based advantages of clustering (e.g. all agglomeration effects), and perhaps, in some cases, those of industrial districts as well.

In the textile and apparel industry, in which China has been an established international competitor for the longest, an agglomerated geography of production has already emerged. Cities in the Guangdong, Zhejiang, and Jiangsu provinces have developed clustered configurations of literally thousands of garment and textile companies and their suppliers in Datang (Sock City), Shenzhou (Necktie City), Puyuan (Sweater City), Changshu (Casual Wear), Jimo (Knitting), Qinghe (Cashmere), as well as cities with specialized industrial bases in childrens’ clothing, underwear, and buttons. (Barboza, 2004, Zhang, etl. al., 2004). These districts house a diversity of firms, ranging from locally generated entrepreneurial startups and domestically-owned suppliers to global lead firms.

An in-depth picture of outsourcing and agglomeration in the electronics sector, presented by Business Week, paints a picture of a fully-functioning electronics manufacturing cluster/industrial district in China’s Pearl River Delta:

"All electronics hardware manufacturing is going to China," says Michael E. Marks, CEO of Flextronics Corp, a contract manufacturer that employs 41,000 in China. Flextronics and other companies are hiring Chinese engineers to design the products assembled there. "There is a myth that the U.S. would remain the knowledge economy and China the sweatshop," says BCG's Hemerling. "Increasingly, this is no longer the case."...Flextronics' campus in the Pearl River Delta town of Doumen...employs 18,000 workers making cell phones, X-box game consoles, PCs, and other hardware in 13 factories sprawled over 149 acres..an additional 720,000-square-

foot factory [is] nearing completion. Almost every chemical, component, plastic, machine tool, and packing material Flextronics needs is available from thousands of suppliers within a two-hour drive of the site. That alone makes most components 20% cheaper in China than in the U.S., says campus General Manager Tim Dinwiddie. Plus, China will soon eliminate remaining tariffs on imported chips. In the past five years, electronic manufacturing-services companies such as Flextronics have cut their U.S. production from \$37 billion to \$27 billion while doubling their China output, to \$31 billion. That's likely to double again by 2007. (Engardio et. al., 2004)

Other reports indicate that China's industrialization is, in fact, cluster-based by design, with regional industrial development priorities established by the government over the past decades. This has yielded powerful clusters such as the automotive industry in Shanghai. Depner and Baltheit (2005) cite previous research indicating that the over 40 percent of Chinese automotive output in 2001 was concentrated in Shanghai, largely owing to separate joint-ventures between a Chinese lead firm and Volkswagen and General Motors that had resulted in the development of an extensive supplier base comprised of both locally-owned and joint-venture companies.

Combined, these anecdotes suggest two conclusions. First, the current phase of globalization is leading to development of agglomerations in a lower cost environment, so it may not be deglomeration or dispersal that is the main story, but rather, lower cost clustering strategies that are sufficiently linked to markets and lead firms to represent a very real challenge to US manufacturing. Second, it suggests that the development of agglomerations in lower-wage locations are also benefiting from "industrial district effects" in certain aspects of the innovation process. Other evidence from the electronics industry, for example, indicates that Chinese producers are already capturing design activities not only in entry-level products such as mobile telephones, but also in wireless networking equipment and other leading-edge telecommunications products (Brown, 2004). We will examine the specific form of this geographic dispersal of innovation-related activity in a later section.

Are Dispersion Economies In Play?

Most discussions of dispersion appear to focus on the effects of factors internal to the region in which firms are clustered. Polenske (2003) indicates that if firms are de-clustering, dispersing, or otherwise deglommerating, that dispersion economies may be at work. Summarizing Weber, Fearon notes, "Deglomeration occurs when companies and services leave because of over concentration of industries or of the wrong types of industries, or shortages of labor, capital, affordable land, etc." (Fearson, N/D). Similarly, Krugman (1998) explains dispersion in terms of (distance from) immobile factors of production, land rents, and pure external diseconomies resulting from crowding and other functions internal to the region.

If, as has been claimed (Roberts, 2004), the offshoring boom is little more than labor arbitrage, these classical interpretations of deglomeration could easily explain US cluster dispersal as a consequence of "distance from immobile factors of production," in this case, the Chinese labor pool. In this case, we should consider the deglomeration of Appalachian industry as part of the process by which cost and market access concerns overwhelm advantages derived from proximity in a higher cost location—a simple re-assertion of classical location theory. There may be more to the story, however. Examination of how this shift is being coordinated

illuminates a new form of production that has not yet been recognized in clusters literature that may need to be recognized as a new firm-organizational context for economic development.

For an understanding of this dimension, we need to turn to a separate literature that examines the structure of the networked firm in the 21st century—specifically, the Global Value Chains literature and recent contributions regarding the industrial organization of production systems that have developed to coordinate these offshore activities of major manufacturing firms.

2. Evolution of New Organizational Forms: Global Value Chains and The Modular Production Network

Conceptually, global value chains are a way of describing the mezo-level industrial organization of globally dispersed production in which the management of supply chains is the operational/management. Gereffi and Sturgeon (2004) write, “Firms are less likely to simply make products and export them; they increasingly participate in highly complex cross-border arrangements that involve a dizzying array of partners, customers, and suppliers. Global outsourcing has given rise to a new and important set of economic structures in the world economy that we refer to as “global value chains”

In this sense, the concept owes something to both the business literature on value chains and supply chain management as well as to previous sociology research on multinational production strategies including the New International Division of Labor School in the early 1980s (Cited by R. Kaplinsky in unpublished communication are Froebel, Heinrichs, Kreye, Helleiner and others). Gereffi and others (1994) previously addressed de-verticalization of industries and advanced the later field by introducing the concept of a “Global Commodity Chain” as a method of directly tying the value chain approach to the global organization of industries (Gereffi, Humphery, and Sturgeon, 2005) and have advanced this understanding through several iterations.

There are a variety of GVC types- those driven principally by a lead-firm’s sourcing strategy, usually found in sophisticated capital intensive industries (producer-driven value chains or captive value chains) as well as those driven by the quick-changing demands of major retailers in developed markets (buyer-driven value chains), as well as conventional market-mediated chains. The most important of these for this discussion, however is the “modular production network.”

Recently, Sturgeon (2002) and others have begun to bring more attention to the *modular production network* as a defining feature of 21st century manufacturing geography. Sturgeon argues that the research community has tended to assume (by omission) static conditions in the costs and complexity of coordination of manufacturing activities across geography. It has not anticipated the development of new organizational forms that reduce the barriers to geographically “cost-optimized” production (whether agglomerated or not), specifically those new organizational forms that Sturgeon (2002) refers to as Modular Production Networks, that have internalized the diseconomies of geographic scale that were previously so daunting as to render global cost optimization strategies accessible only to the largest and most sophisticated multinational organizations.

According to Sturgeon, the phenomenon of modular industrial organization implies an emergent configuration of production that permits lead firms to externalize significant costs and logistics and organizational capabilities to “tier one” suppliers. These firms, in turn, manage numerous functions previously held by the lead firm (OEM or brand owner). These include logistics, sourcing, and overall coordination of production. In the past five years, these suppliers, particularly in Asia, have developed capabilities to manage ever-more complex production and logistics tasks, including the coordination of activities between geographically segmented value-producing nodes in global value chains.

“...a significant number of US electronics companies are adapting to the pressures of market volatility and intensified international competition by developing their own distinctive model of networked production. I call this model the modular production network...”...To meet the growing demand for full-service outsourcing solutions, suppliers have, in many cases had to add entirely new competence areas, increasing their scope of activities while improving quality, delivery, and cost performance. Increased outsourcing has also, in many instances, vastly increased the scale of suppliers’ operations. Thus, outsourcing has led to a deepening of competence and an increase in scale at supplier firms. As an industry’s supply-base comes to be comprised of large, highly capable turn-key suppliers, the prospects for increased outsourcing are improved. In this way, turn-key suppliers and lead firms co-evolve in a recursive cycle of outsourcing and increasing supply-base capability and scale, which makes the prospects for additional outsourcing more attractive, not just to the lead firms that drove the upgrading of the supply base in the first instance, but for those lead firms just beginning to seriously consider large scale strategic outsourcing (Sturgeon and Lee, 2001).” (Sturgeon, 2002 p.XX)

Gereffi and Sturgeon vividly illustrate how these global sourcing arrangements have “dismantled” a local cluster in one industry, describing the recent transition of electronics manufacturing in the Merrimack Valley of Northeast Massachusetts from the status of “cluster” to that of “hub” (or, perhaps more appropriately, node) in an emergent global value chain (modular production network). The Merrimack Valley’s manufacturing base in the second half of the 20th century had evolved through defense electronics, minicomputers, and, most recently, communications equipment manufacturing. A central principal of cluster theory, that the competencies of the mid-skilled workforce comprised a key asset permitting the region to support an evolution of the industrial base over time appeared to remain in force. Focusing on the rise and fall of employment in the communications equipment manufacturing firm in the boom of the late 1990s, they show how the widespread outsourcing of production by lead firms such as Cisco and Lucent to global contract manufacturers, these contractors’ established networks of facilities worldwide, their widespread use of temporary and contract employment replacing traditional employment arrangements, and their actual ownership of production lines within the Cisco facility significantly undercut the cluster-based advantages that the region’s mid-skill workforce once offered lead firms.

What was previously highly immobile, less-skilled technical labor is now readily available, not through immigration, which would keep the production in the area, but instead in the far-flung network of plants owned and operated by global contract manufacturers, such as Solectron and Celestica. The global footprint of these contract manufacturers, which includes dozens of facilities in western and eastern Europe, Mexico, South America, and East Asia, enables

contractors to spirit work away at a moment's notice. The manufacturing economy of the Merrimack Valley has been transformed, unalterably it seems, from a locally connected, cluster-based economy to a globally connected, hub-based economy subject to the decisions of firms that have what is approaching total geographic flexibility" (Gereffi and Sturgeon, 2004).

As modular production systems have evolved, cost-related benefits of offshore outsourcing have become accessible to more firms- not just large multinational operations with internal capacity for coordinating international production, but also to smaller companies (including start-ups) who increasingly can source manufacturing/production to existing modular production systems that handle all aspects of production in a "turn-key" manner. Sturgeon concludes that these networks are developing in a diversity of industry sectors:

The modular production network model is derived from research on the product-level electronics manufacturing (computers, communications equipment, consumer electronics, etc.) where the organizational shift, from in-house to outsourced manufacturing has been dramatic in recent years. However, other research strongly suggests that comparable changes are underway in many other sectors as well, such as apparel and footwear, toys, data processing, offshore oil drilling, home furnishing and lighting, semiconductor fabrication, food processing, automotive parts, brewing, enterprise networking, and pharmaceutical production..." (Sturgeon, 2002)

Recent anecdotal evidence obtained by RTS in personal interviews and communications with venture capitalists and electronics equipment manufacturers suggests that even relatively small venture-backed electronics companies are pressed to consider offshore production as a first resort. Industry resource website "Outsourcing.com" prods visitors that "if you're not outsourcing abroad yet, your board (of directors) will soon be asking why." Better documented is the fact that venture-backed software and IT services startups are outsourcing programming and other IT functions in the pre-product launch phase.

3. Technology and Organization make Innovation more Portable

Finally, evolving communication and information technology are breaking down the processes underlying product innovation into a larger number of more geographically "portable" and "communicable" segments. By conceptualizing clusters as functionally integrated nodes on global value chains that produce knowledge, norms, strategies, technologies, methods, plans, or products, we also gain insight on how innovation activities are likely to "break" across value adding activities. In effect, while specific innovation(s) will continue to occur in one place or "node" (cluster, industrial district) at a time, these loci of innovation are increasingly linked to other geographically disparate nodes through formalized and technologically enabled mechanisms of communication. With this new organizational form comes a broadening of the geographic scale at which innovation can efficiently take place and be translated into products. Sturgeon argues:

distinct breaks in the value chain tend to form at points where information regarding product specialization can be highly formalized. I posit, following the literature on modular product design, (Ulrich, 1995; Sanchez and Mahoney, 1996; Meyer and Lehnerd, 1997; Thomke and Reinertsen, 1998; Schilling, 2000), that *within functionally specialized value chain nodes,*

activities tend to remain tightly integrated and based on tacit linkages. Between these nodes, however, linkages are achieved by transfer of codified information. Such linkages have many of the benefits of arm's length linkages—especially speed and flexibility—while allowing for a rich flow of information between firms. The locus of these value-chain break points appear to be largely determined by technical factors, especially the open and de facto standards that determine the protocol for the hand-off of codified specifications. (Sturgeon, 2002)

Gereffi, Humphrey, and Sturgeon (2005) further refine this idea, developing a three factor model based on the complexity of information and knowledge transfer, the extent to which information or knowledge can be codified for transfer, and the capabilities of suppliers to assist in determining where these spatial breaks in value chains are likely to occur. *Relational* value chain relationships tend to arise where the requirement to transfer of non-codifiable information is frequent and therefore relationship-intensive and requiring extensive face-to-face contact and tacit knowledge transfer, very similar to the industrial districts-cum-clusters model. *Modular* value chains proliferate as protocols for the transfer of technical product specification become more standardized and therefore easier to transfer across geographic, organizational, and cultural space.

Clusters in this case represent the “functionally specialized value-chain nodes” inside of which non-codifiable (or tacit) information flows occur. This reinforces the proposition that non-routine, innovation-driven, and more complex functions will continue to concentrate spatially. There is only limited evidence that translating innovation into products will continue to require the kinds of localized learning economies first described by Marshall and now thought of as “soft economies” of clustering, or if it will, for how long. To the extent that higher-order activities result in an output (plans, designs, prototypes) that can be codified according to standard/accepted communications protocols, production becomes a candidate for lower-cost offshore outsourcing.

This proposition is supported, to some degree, by recent work on the “fragmented firm.” Following work by Edward Hill (Forthcoming), Sommers and Carlson (2004) found that vertically integrated firms *across industries* are distributing their activities by *functi* to regions in which specialized comparative advantage exists. They suggest that five types of activities are clustering across industries in specific US and global locations: headquarters, research, design, and product development, production, marketing and sales, and distribution and logistics (Sommers and Carlson 2004). This suggests that the *functional* role of industry clusters in producing specific types of innovations may be more important to the continued viability of U.S. clusters.

4. Counter-Trend Evidence: Offshore Outsourcing and its Discontents

In 2004 and 2005 some experts from within manufacturing have begun to call into question the advantages of offshore outsourced manufacturing, particularly in China. Their principal objections and concerns relate to the real costs savings, speed and flexibility, and supply chain risks that can make offshore outsourcing inappropriate for some companies and products. Specifically:

- First, while labor costs in China are low, accessing these may require entering agreements with agents that significantly undercut labor cost savings, at least in initial outsourcing relationships. One consultant estimates fully-loaded China labor costs at above \$5.00 per hour. Since direct labor costs typically account for only around 4-5% of product costs. Second, non-shipping logistics costs are significantly higher—up to 12% of revenue in China versus an average 3% in the US. In addition, search costs for partners, costs of addressing quality issues, and travel and communications can add 24% to baseline costs. The argument presented is that cost savings may be illusory given the additional costs, and furthermore, that product redesign using “Design For Manufacture and Assembly” could yield more cost savings for manufactured products than offshore production (Dewhurst et. al. 2004).
- In addition, in order to make offshore outsourcing work, business processes must also be optimized. Many US manufacturers—especially small and medium-sized companies—do not have well-enough thought-out or documented processes to outsource. Cost savings can be undercut by lack of robust manufacturing processes as well. In making the case for “smart outsourcing,” industry experts are urging the use of outsourcing to complement US operations, rather than to replace them (Purdum and Teresko, 2004).
- Offshore goods also require longer shipping times. Chinese goods shipped by container typically take 60 days to reach US warehouses, as opposed to approximately two weeks for US orders. Where rush orders are necessary, significant air freight costs may be incurred, further undercutting labor cost savings. Finally, US customers must absorb costs of several weeks’ inventory while goods are being shipped, adding further to costs (Brown, 2005)
- Reduced flexibility to change products in response to market demand is another potential consequence of offshore outsourcing. Roger Wery, practice leader for outsourcing strategy at consulting firm Pittiglio Rabin Todd & McGrath indicates that China production significantly reduces flexibility in responding to product changes. "A producer in the United States can respond within 24 hours to changes in product mix, such as color, packaging, and delivery location...In Mexico, it takes about three or four days. In China, they need five to six weeks." (Brown, 2005)
- Manufacturing offshore may carry significant supply chain risk. Containers tend to change hands 17 to 24 times while crossing the 7000 mile supply chain to the U.S., and this introduces risk of product loss, delivery delays, and bottlenecks. (Brown 2005, Dewhurst 2004). These risks may make production offshore too risky for smaller companies producing lower volumes- especially where loss or delay of a single shipment could significantly impact revenues, and particularly in key sales seasons (e.g. Christmas holidays).

According to recent business press reports, offshore production still cannot meet all the needs of US manufacturers, suggesting that certain types of companies may, upon serious examination, decide that offshore manufacturing does not offer sufficient benefits when weighed carefully against combined costs and risks. These emerging reports, contrary to recent assessments of global value chain growth, suggest that strategies for manufacturing modernization which were in vogue in pre-clusters periods, may again be relevant approaches to addressing manufacturing costs in an era of offshore outsourcing.

Summary Observations and Implications:

It appears that, today, competitive advantage in many value chains has shifted to global production strategies utilizing significant offshore outsourcing for at least part of most manufacturing activities, and that only very specific functions of manufacturing-oriented clusters can be expected *not* to be susceptible to these pressures. Yet, despite these indications, there is new evidence emerging that the difficulties of offshore production means that those activities that are very sensitive to domestic end-user markets (speed) will tend to remain in the US. If this is true, the global value chain *function* of particular clusters becomes even more important to understand. Additionally:

- With or without clusters, it appears that few of the cost-driven manufacturing activities that we have managed to retain will remain, except where these are driven by extremely short demand sides, small runs, etc, all of which introduce supply-chain risk that may outweigh cost considerations (at least for now).
- It appears that shorter “sections” of industry value chains’ value-adding activities are likely to be performed in any single US cluster because market-serving production networks are gaining capacity in coordination around distributing them to the most appropriate location vis costs and skills. The utility of descriptive measures of cluster competitiveness such as those articulated by Enright may be less important determinants of cluster futures than issues of complexity of information/knowledge transfer, codifiability of information and product specifications, and capacity of the supply base (Gereffi, Humphery, and Sturgeon 2005).
- Does this mean that the activity-rich cluster is a thing of the past? That clusters will only house innovative activities for shorter parts of the value chain? It seems to imply that the idea that an “activity-rich” cluster is only relevant to the extent that those activities draw on a very specific (non-generic) pool of talent or are not communicable through standard means.
- We should not completely discard the cluster concept, if only because China seems to be succeeding so well with it. Evidence of dispersal in the United States should be viewed in classical location theory terms—a function of non-competitive immobile factor costs. A more critical question is, “Can clusters in Appalachia that have developed ‘organically’ (over time) compete with clusters (in China or elsewhere) that have been ‘engineered’ explicitly to take advantage of scale (agglomeration) as well as industrial district effects (knowledge and technology spillovers) in a much lower cost environment than is feasible in the U.S.?”
- At the outset, it would seem that regions with a technology creation function will continue to benefit from “lock-in/first mover advantage” since the very early state innovation needs a richer relational value chains context to get off the ground (See also Powell, 1998). Unless entrepreneurial companies in new and emerging industries are very aggressive in pursuing globally outsourced production from a very early stage, it is likely that they will neither have highly codified product specifications nor well developed supplier bases sufficient to permit offshore outsourcing. This could serve to create important manufacturing opportunities for

technology generating regions. In cases where these firms are aggressively pursuing global production strategies, the “internal” production networks of turn-key may “internalize” many of the product-based learning at a global, rather than regional, scale.

- Clusters literature—following from industrial districts—has focused a lot on how inter-firm learning occurs at the regional level through tacit knowledge transfer and other positive externalities. Today it appears that learning (both firm and policy) need to concentrate on how coordinating production *across* regions can best be achieved. In other words, the learning that takes place in the process of interconnecting geographically disparate productive nodes may have become as important as or more important than regionalized learning economies in manufacturing. Markusen reached this conclusion nearly a decade ago, writing, “economic development strategies built on cross-regional alliances might be as important to localities as purely local networking approaches.” (1996, p. 310). This would also explain the growth of interest in the supply-chain in academic business literature.
- A related implication is that we cannot assume that domestic industry clusters will be the only (or even the primary) loci of learning when it comes to manufacturing production, particularly where product specifications and other information can be codified and transferred to highly capable suppliers. If industrial districts theories hold true, there will be a lot of manufacturing process and coordination innovation emerging from the electronics and other industries in China and other offshore and near-shore locations.
- One redeeming finding is that there is some evidence that domestic manufacturers can be price competitive through design simplification, or at least that the cost advantage of offshore production can be significantly undercut by more intelligent manufacturing processes. This suggests that product redesign for cost competitiveness and other types of rationalization in engineering and shop floor processes have at least limited implications for the viability of some Appalachian manufacturing clusters, particularly those that are populated by medium-sided branded-product firms—those with a high potential to deploy offshore outsourcing for cost competitiveness reasons.

Implications for the ARC Non-Metro Clusters Case Studies.

A few implications for case study research have emerged from this analysis:

- It is absolutely essential to begin examining Appalachian clusters with greater attention to their role(s) in the global value chains of which they are a part. Little can be said about the future prospects of an existing cluster without a much greater degree of awareness of the global-level organization of production and markets.
- The fact that many Appalachian manufacturing clusters have survived up to this point is an accomplishment in itself. Our case study research should try to discern how and why this has been the case. Are thriving firms serving principally local or time-sensitive markets? Have they adopted design innovations to reduce labor costs and streamline production? Or is

supplier capacity abroad simply too low to sustain a modular production network that restructures industry costs?

- In exploring Appalachian clusters' history, we also need to think more *functionally* about what kinds of manufacturing activities non-metro clusters do. While Sommers and Carlson (2004) and Hill (forthcoming) make a start at this kind of functional thinking in characterizing regional clusters by broad function (headquarters, research/product development, manufacturing, etc.), it is not specific enough to be operationalized in comparative case studies or cluster analyses within the domain of manufacturing. Some functional typology of Appalachian clusters would be the next step in this direction, but it does not appear that we know enough about the market-serving functions of non-metropolitan clusters in Appalachia to determine an appropriate typology at this point.
- We should pay particular attention to the question of whether there are Appalachian manufacturing clusters that serve similar functions in multiple value chains due to process or technology expertise. These clusters may be more or less vulnerable depending on the degree to which non-codifiable (and difficult to export) manufacturing *processes* are developed there, to the extent that they serve specific kinds of firm customers that require short product cycles or speed-to-market, and other factors.
- In characterizing clusters' competitiveness, it may also be wise to separate descriptive measures of clusters like those presented by Enright and look more carefully at specific customers' (firms) needs for speed and adaptability. It may be that new factors, such as the market-serving strategies of lead firms, rather than more conventional measures of clusters such as breadth, depth, or innovativeness, will be more important determinants of cluster viability in the coming years.

Sources Cited

Accelerator Group (2004) 'Impact of Offshore Outsourcing on the Manufacturing Sector in Michigan and the United States.' (Detroit: Detroit Regional Chamber of Commerce). June.

Ante, S. and Hof, R. (2004) 'Look Who's Going Offshore.' Business Week. May 17.

Atkinson, R. (2004) 'Understanding the Offshoring Challenge' PPI Policy Report (Washington: Progressive Policy Institute). May.

Barboza, David. (2004) 'In Roaring China, Sweaters are West of Socks City.' New York Times, December 24.

Bayard, M., (2005). 'Enhancing Competitiveness: A Review of Recent State Economic Development Initiatives.' Washington: National Governors Association Center for Best Practices.

Bernard, A., Jensen, J.B., Schott, P.K. 'Assessing the Impact of Trade Liberalization on Import-Competing Industries in the Appalachian Region.' September, 2004.

Brofenbrenner, K, and Luce, S. (2004) 'The Changing Nature of Corporate Global Restructuring: The Impact of Production Shifts on Jobs in the US, China, and Around the Globe' U.S.-China Economic and Security Review Commission. October 14.

Brown, A. (2005) 'The China Road.' Mechanical Engineering. March. Internet Retrieval.

Camagni, R. (1992) Introduction: From the local 'milieu to innovation through cooperation networks," in Camagni (Ed) Innovation networks: spatial perspectives. New York: Belhaven Press.

Depner, H. and Bathelt, H. (2005): Exporting the German Model: The Establishment of a New Automobile Industry Cluster in Shanghai. In: Economic Geography (Vol. 81) pp. 53-81.

Dewhurst, Nicholas and Meeker, David, (2004) "Improved Product Design Practices Would Make U.S. Manufacturing More Cost Effective, A Case to Consider Before Outsourcing to China" (Boothroyd Dwehurst, Inc., Wakefield, RI), Internet Retrieval

Dicken, P. (2003) Global Shift: Reshaping the Global Economic Map in the 21 st Century, 4th edition, London: Sage.

Engardio, P, Roberts, D., (2004) 'The China Price.' Business Week. December 6. Internet Retrieval.

Engardio, P. and Einhorn, B. (2005) 'Outsourcing Innovation.' Business Week. March 21. Internet Retrieval.

Enright, Michael J. (1998), "The Globalization of Competition and the Localization of Competitive Advantage: Policies toward Regional Clustering" in Hood, N and Young S. eds. Globalization of Multinational Enterprise Activity and Economic Development, (Advanced copy: no publication information provided).

Enright, Michael J. (2000) "Survey on the Characterization of Regional Clusters" Working Paper. Institute of Economic Policy and Business Strategy: Competitiveness Program, University of Hong Kong. March.

Enright, Michael J. (2001) 'Regional Clusters: What we know and what we should know.' Paper prepared for the Kiel Institute International Workshop on Innovation Clusters and Interregional Competition. 12-13 November.

Fearon (no date), 'Alfred Weber: Theory of the Location of Industries, 1909' Center for Spatially Integrated Social Science. Internet Retrieval. <http://www.csiss.org/classics/content/51>

- Feser, E. J., Koo, J., Renski, H., and Sweeney, S. H. 2001. 'Incorporating spatial analysis in applied industry cluster studies.' Working paper
- Gereffi, G., and Korzeniewicz, M. (eds). (1994) *Commodity Chains and Global Capitalism* Westport, CT: Greenwood Press (hardcover) and Praeger (paperback).
- Gereffi, G., (2001) "Shifting Governance Structures in Global Commodity Chains, With Special Reference to the Internet." *American Behavioral Scientist*, Vol. 44 No. 10, June. 1616-1637
- Gereffi, G., Humphrey, J, and Sturgeon, T. (2005) The Governance of Global Value Chains. *Review of International Political Economy*. (London: Routledge). Vol. 12:1 February. pp. 78-104(27)
- Gereffi, G. and Korzeniewicz, M. (eds) (1994) *Commodity Chains and Global Capitalism*, Westport: Praeger.
- Gereffi, G., and Sturgeon, T., (2004) 'Globalization, Employment, and Economic Development: A Briefing Paper' Sloan Workshop Series in Industry Studies Rockport, Massachusetts, June 14-16.
- Hill, E. Forthcoming. Work on Fragmented firm quoted in Sommers and Carlson based on Personal Communication from the author.
- Kotkin, J. (2000). *The New Geography: How the Digital Revolution is Reshaping the American Landscape*. New York: Random House.
- Krugman, P. (1998). 'The Role of Geography in Development.' World Bank Conference on Development Economics. Washington: World Bank. April 20-21. p. 3.
- Ludvall, Bengt-Ake (Ed.). (1992) *National Systems of Innovation: Toward a Theory of Innovation and Interactive Learning*. London: Pinter Publishers.
- Maniscalco, M., (2004) 'Manufacturing in China? The true cost may surprise you.' *Injection Molding Magazine*, November. Internet retrieval: http://www.immnet.com/article_printable.html?article=2491
- Markusen, A. (1996) "Sticky Places in Slippery Space: a Typology of Industrial Districts." 1996. *Economic Geography*, Vol. 72, No. 2: 294-314.
- Polenske, Karen R. (2003) 'Clustering in Space versus Dispersing over Space: Agglomeration versus Dispersal Economies.' *Innovation, Entrepreneurship, Regional Development, and Public Policy in the Emerging Digital Economy*. Trollhättan, Sweden.
- Porter, M., Ketels, C., Miller, K., Bryden, R. (2004) 'Competitiveness in Rural U.S. Regions: Learning and Research Agenda' (Cambridge: Harvard Business School Institute for Strategy and Competitiveness). February 25.

Powell, W. (1998) Learning from Collaboration. *California Management Review.*, Vol. 40:3, Spring.

Purdum, T., Teresko, J. (2004) 'Smart Outsourcing.' *Industry Week* October 1. Internet Retrieval.

Regional Technology Strategies, (1997) Exports, Competitiveness, and Synergy in Appalachian Industry Clusters. Report to the Appalachian Regional Commission. Carrboro, NC.

Roberts, P. (2004) 'The Harsh Truth about Outsourcing.' *Business Week*. March 22. Internet Retrieval.

Rocha, Hector O., (2002) "Entrepreneurship and Development: The Role of Clusters." *Small Business Economic Journal*, 2002 (pre-publication copy: no volume/page numbers).

Rosenfeld, S. (2001) 'Advancing the Understanding of Clusters and their Opportunities for Less Favored Regions, Less Advantaged Populations, and Small and Mid-Sized Enterprises' *Regional Technology Strategies, Inc.* November.

Rosenfeld, S (2001b) "Networks and Clusters: The Yin and Yang of Rural Development," in *Exploring Policy Options for a New Rural America*, (Kansas City, Missouri: Federal Reserve Bank of Kansas City).

Rosenfeld, S. Jacobs, J, and Liston, C. (2003) 'Targeting Clusters, Achieving Excellence' (Carrboro, N.C., *Regional Technology Strategies*).

Schmitz, H. (1997) Collective Efficiency and Increasing Returns. University of Sussex, Institute of Development Studies Working Paper 50, March.

Sturgeon, T. (2002) 'Modular production networks: a new American model of industrial organization', *Industrial and Corporate Change* 11 (3): 451--496.

Sommers, P., and Carlson, D. (2004) 'What the IT Revolution Means for Regional Economic Development' (Washington: Brookings Institution Center on Urban and Metropolitan Policy). February.

USDA Economic Research Service (1995) "Understanding Rural America," (Washington: USDA) February.

Waits, M. (2000) "The Value Added of an Industry Cluster Approach to Economic Analysis, Strategy Development, and Service Delivery" *Economic Development Quarterly*. Vol. 14 No. 1, February. 35-50

Zhang, Z., To, C., Cao, N. (2004) 'How do Industry Clusters (sic) Success: A Case Study in China's Textiles and Apparel Industries.' *Journal of Textile and Apparel Technology and Management*. Raleigh: North Carolina State University. Vol. 4:2. Fall.

*Note: Several paragraphs in this paper were extracted in whole or in part from Rosenfeld, 2001.

White Paper

Learning Based Economies in Non-Metro Counties

Appalachian Regional Commission

March 2005

Regional Technology Strategies

I. Introduction

Currently there are two parallel streams of thought and research about learning-based economies, both dating back at least a century. “Human capital” theories are top down, driven by public institutions and public policy. “Learning region” theories are bottom up, driven by social norms, associational structures, and workplace organization. The more traditional and widely accepted human capital view of learning is tightly linked to research on education and training—human resource development.ⁱ This line of research focuses on demonstrating the value of education, educational attainment, and skill development to regional or national economic outcomes. The research that correlates measures of educational attainment or achievement to economic outcomes, dates back to Horace Mann’s circulars, which asked business owners in Massachusetts to estimate the dollar value of educated workers to their profits.

Newer (or, more accurately, rediscovered) learning theories assume that the economic development of regions is linked to the informal knowledge that is embodied in and transmitted through the social and organizational structures of businesses, communities, and societies. This idea that access to the non-codified, or tacit, knowledge that resides in people’s heads and organizations’ routines drives innovation dates back to the beginning of the 20th century. Alfred Marshall attributed the success of industrial districts to the informal flow of ideas and information. This hypothesis is more resistant to quantification, and generally demonstrated through network analysis and with anecdotal evidence.

Both of these lines of research will be discussed as they affect and are affected by non-metro conditions and industry agglomeration. The first is based on traditional human capital theory and focuses on the individual. The second is based on “learning” theories as applied to people, companies, and places, and requires some store of social capital. Human capital assumes rationality and transparency; learning occurs through socially determined values and norms.ⁱⁱ

II. Human Capital

Relationships between human capital and economic development in rural areas have been acknowledged and thoroughly studied for decades. The importance of education to economic development in rural areas was a significant part of Roosevelt's Carnegie Commission Report on Rural Life highlighted the importance of education to rural economies. Human capital theory presumes that the knowledge and skills of the work force are contributing factors to economic growth. In conventional econometric models, human resource development accounts for anywhere from 20 to 80 percent of growth. Increased skill and knowledge, when applied to work situations, leads to higher productivity and increased innovation, which is used to justify public expenditures on training and induce businesses to invest more in education and training. Some economists have shown that the contribution of knowledge and education to productivity far exceeds that of capital.ⁱⁱⁱ This suggests to both governments and businesses that investments that increase the value of human capital produce higher rates of return than investments in physical capital, and therefore they would be wise to invest in education and training.^{iv}

Modern human capital concepts developed by Schultz and Gary Becker and, with respect to agglomeration, by Paul Krugman provide a theoretical basis for the importance of human capital, and Ray Marshall, Eli Ginzberg, Sar Levitan and many others have provided a more practical set of principles for human resource development policy. Schultz's research led to the additional finding that "the supply of entrepreneurial ability is definitely increased by additional schooling."

There are basically three ways that human capital plus the system that develops it contribute to non-metro economies. The first is *direct*, the impact of a more skilled and creative workforce. The second is *induced*, the impact of better education on the location choices of employees and employers. The third is *contributory*, the impact of education and training institutions and organizations as a source of employment and external revenues. The impacts of the first two, in particular, are affected by agglomeration.

A. Incumbent and potential labor force

The more common means for assessing human capital is to estimate the scale and productivity of the workforce. Scale is measured in total numbers of people in the work force, diplomas, certificates, and degrees awarded, number completing relevant programs of study, and average levels of educational attainment in the population. The numbers of college graduates in the Appalachian counties of most ARC states is significantly below those in non-ARC counties. In Kentucky, Ohio, Maryland, and Virginia, rates in ARC counties are about half those in non-ARC counties. Alabama and South Carolina are the exceptions, where ARC graduation rates are low, but not as low as those in non-ARC areas, which may be attributable to racial or ethnic differences.^v Occupational projections, however, suggest that about eighty percent of the work force over the next ten years will require some postsecondary education.

Advocates for education and training argue that companies benefit from a more highly trained workforce but findings don't support this hypothesis—at least for manufacturing. A study of the

non-metro South in the 1980s found that a 10 percent increase in educational attainment resulted in a 3.8 percent increase in total employment—but a net loss in manufacturing employment.^{vi} A review of the literature on plant locations conducted in 1994 concluded that “education levels of the local work force have not been important determinants of local employment growth in the rural areas of the United States.”^{vii}

A more recent study on impacts of education discovered much more modest gains—that a five percent increase in share of population attending college in non-metro counties is associated with a 0.15 percent increased in annual income growth of \$325 annually.^{viii} A concurrent study found that a one percent increase in high school completion rates among adults resulted in an additional \$128 income per capita per year.

This is not surprising since traditional manufacturing has lower skill requirements and fewer requirements for technical expertise. But in today’s economy, with less labor intensive manufacturing and more knowledge based industry, conditions are very likely quite different. A recent USDA Economic Research Service study showed that the percent of rural employment in rural low skilled jobs declined from 49.4 percent in 1980 to 42.2 percent in 2000 (still far above the U.S. average of 35.5 percent). More of the decline was attributed to changes in skill needs due to technology within industries than to changes in industrial mix.^{ix}

Entities, in addition to the companies themselves, that deliver incumbent and entering worker training include vocational-technical schools, community and technical colleges, manufacturing extension partnerships, cooperative extension, university continuing education, and various community based organizations. Potential sources of funding are the federal Workforce Investment Act and Trade Adjustment Assistance Act, state sponsored workforce development programs, and foundation-supported programs. Most require some match from the client and most have specified priorities, such as globally threatened or targeted industry sectors, low-income or underserved population, or industries paying above average wages.

One consistent finding is that businesses surveyed, in the absence of government subsidies or incentives, under-invest in human resource development, and small and mid-sized businesses under-invest the most often due to insufficient resources or fear of poaching by larger, higher wage employers. Interest in skill acquisition among workers was mixed. Almost half of employed workers expressed strong interest in learning new skills but most saw no connection to higher quality of life of new jobs.^x

One of the most serious human capital challenges for rural areas over the past century has been keeping youth, particularly the most educated youth, from leaving for urban amenities and better job opportunities. Many of the rural educational programs, from agricultural education to 4H, were efforts to make education more relevant to rural life and interesting. No one, however, has solved the persistent problem of rural out-migration. While educational attainments levels have been rising in the U.S. constantly, gains in metro counties far exceed gains in non-metro counties, and non-metro non-adjacent counties fare the worst.^{xi} Surprisingly, rural counties (i.e., Beale Code) increased their shares.

B. Locational effects of contributions to quality of life

The quality of the local schools is a predictor of the quality of the future labor force if the more qualified and high achieving youth can be convinced not to leave. and it's a major factor in where young and discriminating families choose to live and therefore where employers who need these employees will locate plants. Since states now publicize the rankings of school systems based on average standardized test scores and qualifications under "no child left behind," it is easy to compare school systems. More sophisticated parents are likely to also look at and compare per pupil expenditures, class size, qualifications of teachers, and availability of special programs such as languages and arts, gifted and talented, and special education. Non-metro school systems in virtually every state rank lower than urban systems on most all measures.

The economic impacts of relative measures of quality of education are difficult to disentangle from relative measures of the population at large (i.e., completion rates, educational attainment). The measures of quality are not easily applied to impact studies because of the difficulty in aggregating school districts to the county or regions that are units of analyses for economic studies. Pennsylvania, for example, has 501 school districts but 67 counties. Ohio has 662 school districts and 88 counties. Therefore most analyses are constrained to data that are available by counties, not school systems.

The major economic impact of quality of schools is its effect of location decisions of companies, which in turn is affected by location preferences of key employees. But this may affect only certain industries and companies. Among rural manufacturers asked in 1996 to name the top five barriers to competitiveness, only those in the Southern region listed quality of primary and public schools, and there it was number five, well behind quality of labor, amenities, regulations, and taxes.^{xii}

The states dominate this formal aspect of human capital, with requirements in most state constitutions for some form of "thorough and efficient" public education for all its citizens. Thus, most funding for education comes from the public sector and must be distributed in a way that is independent of local wealth. Equalizing resources among school districts is a relatively recent requirement in ARC states, and only as a response to legal challenges such as Pauley v. Kelly in West Virginia in 1979. States on average pay about half the education bill, and local governments, which have greater disparities in ability to generate taxes, pay about 43 percent. Federal funds for education are relatively small (the remaining seven percent of the total budget) and mainly have been targeted to specific programs such as career and technical education and to compensate for special needs of students.

Private schools are a major site and home selection consideration in some areas. They have been particularly important in the South and in non-metro areas, where public education has historically been weaker. Some private schools are intended to provide a higher quality education for those who can afford the tuition but others are based on religious values (e.g., parochial and fundamentalist schools), cultural identity (Japanese or Spanish language schools), pedagogies (e.g., Montessori schools), or special interests (e.g., arts or military academies).

Access to private schools is another factors people and companies consider in their location choices.

C. Direct Employment

The education and training institutions represent a large direct source of employment and, where concentrated, can constitute a sizable portion of total regional employment and may in some places even constitute a form of “cluster.” About six percent of all employment in the United States is in the education sector, and the projected growth rate is almost 25 percent, which is 67 percent above the overall national employment growth rate. In rural counties, the proportion working in education is usually even greater. Since most of the revenues are from state or federal sources, education is a value added industry from the local perspective.

D. Agglomeration effects

Agglomeration has three impacts on human capital. The first is the effect first noticed and described by Alfred Marshall in industrial districts described as the "mysteries of industry" that children learn unconsciously and others breathe in through the air.” “Workers by associating with one another teach one another." He argued that innovation is a collective experience and that "If one man starts a new idea, it is taken up by others and combined with suggestions of their own; and thus it becomes the source of further new ideas."^{xiii} Further, he hypothesized that association leads to learning. "When large masses of men in the same locality are employed in similar tasks, it is found that, by associating with one another, they educate one another."^{xiv} Marshall refers to processes of transmission of ideas that occur through inter-firm mobility of skilled workers, social institutions, and business organizations.

Paul Krugman later developed economic models to demonstrate Marshall’s theories that pooled markets for workers with specialized skills result in clusters. His model explains why the advantages associated with access to labor pools with specialized skills outweigh the disadvantages of potential poaching of employees by competitors.^{xv} Clusters should also benefit workers because they would be less dependent on fewer employers and also protected against fluctuations in demand. One study did indeed show that the presence of clusters (based on the most basic two-digit industry classifications) is associated with higher wages even after accounting for characteristics of workers.^{xvi}

A second agglomeration effect is in the increase in workforce development networks formed among companies with similar needs. A survey of 1,600 employers and 250 community colleges in the rural U.S. found that employers rely heavily on networks. The author identified four structures for the networks: sole providers; hub-spoke, usually with a CBO at the center; employer-centered networks; and sector- or cluster-oriented cluster networks.^{xvii} The networks were most often industry specific (44 percent), community specific (38 percent), and supply chain driven (26 percent).

The third advantage of agglomeration is that the workforce is more likely to have learned and possess the special knowledge of the peculiarities of the structure and work environment

common to the cluster, and that these contextualized skills allow them to apply their knowledge more directly to the work environment of the cluster. This was the rationale behind the requirement that has been part of the federal Carl Perkins Act since 1984 to teach “all aspects of the industry,” that employees who understand the way their industry works are more productive and have more opportunities to advance.

E. Measures

The following are available data that could be used as independent variables against which to measure changes in economies.

1. Infrastructure

One measure of human capital is based on the systems that develop them—the public and private schools, colleges and universities, CBOs, and training programs. This measure is particularly important because it also represents a measure of a region’s capacity to develop its human resources.

- Enrollments in community colleges
- Enrollments in colleges or universities
- Availability of advanced technology center
- Number of community based organizations that deliver or support education or training
- Number of and enrollments in private schools
- Number of technical and commercial occupational programs

2. Inputs

A second measure is based on the resources that are allocated to education and training.

- Educational expenditures per pupil, K-12
- Higher educational expenditures per capita
- Number of businesses that receive state or federal training dollars
- Public sector plus matching dollars used for company or worker training
- Number of computers per student in school

3. Outputs

A third type of measure of human capital commonly used is an estimate of the results of education and training.

- Graduation or dropout rates
- Numbers of certificates and degrees awarded by community colleges
- Baccalaureate and high degrees awarded by four-year institutions
- Average achievement scores on standardized tests or college entrance exams
- Proportion of high school graduates entering higher education
- Number of incumbent workers enrolled in government supported training programs

4. Labor force

Finally, certain traits of the adult population from which much of the labor force is drawn are used to estimate human capital.

- Average educational attainment of adults 25 and older
- Proportion of adults that have completed high school, college
- Number of scientists, engineers, and technicians in workforce

III. Learning Theories

Formal education and training explain only a small fraction of how learning occurs and skills are acquired. Conventional labor market theory "ignores the fact that much of our human capital is acquired on the job rather than in formal education....in an informal process of one worker training another."^{xviii} Research in the U.S. has shown that 80 percent of what employees need to know to perform their work is acquired informally. Human resource development depends not simply on levels of skills and knowledge that one can measure through educational levels and achievements but on how they are combined with other knowledge acquired independently and sometimes surreptitiously and how they are put to use in the workplace to create new knowledge and innovation.

How does a company's (and a community's) labor force acquire the sum total of its knowledge and skills, and under what conditions can it use them to their fullest advantage to affect productivity, innovation, and, collectively, regional economic development? This section will summarize some of the research on learning from the perspective of the individual, firm, cluster, and region.

A. Learning among individuals

The pedagogy of learning is different from that of teaching. Learning is a continual process that results in incremental increases in a person's base of knowledge. It is acquired from experts and teachers but also from exchanges with social relationships and from the process of applying existing knowledge to find solutions to new problems. Learning occurs just as often informally, through information gleaned from reading, watching, and listening to others with experiences that bear directly or indirectly upon one's own work, and casually through social and professional interaction with peers and mentors. Learning and applying what is learned is what leads to technological advancement. "Learning is the new form of labor: [It's] no longer a separate activity that occurs either before one enters the workplace or in remote classroom settings...Learning is the heart of productive activity."^{xix} In clustered economies where residents are more apt to share work experiences, more direct effects on productivity are likely to be found.

B. Learning and agglomeration

Learning has always been, and remains, one of the most fundamental reasons for, and value of, regional agglomerations of like and related companies, or clusters. Technological advances in communications have not, according to most analysts, replaced the informal learning across a sector, or cluster, has a long tradition in rural America, with roots in the Grange, the Farmers Alliance, and the populist movement—all of which intentionally facilitated the free exchange of agricultural knowledge throughout the industry. In non-agricultural settings, much of Alfred Marshall's work focused on learning as a (probably *the*) critical factor in industry agglomeration. Contemporary concepts of learning regions are included within the recent deluge of literature on industry clusters, districts, and networks, especially out of Europe. It includes learning ranging from informal/unintentional to structured/ intentional and from what Peter Maskell calls "local

buzz” to “global pipelines.” Much of the technology transfer literature focuses on creating opportunities and building structures for knowledge spillover.

One of the leading economic advantages of clusters is the opportunities for knowledge spillover and know how trading. The disadvantages associated with leaking proprietary knowledge are outweighed by the advantages of learning about new technologies and techniques, through both formal and informal means. Von Hippel’s research on informal know how trading in the U.S. steel industry found that exchange among competitors is most effective when know how is proprietary only by virtue of secrecy and when its value is too small to justify an explicit contract.^{xx} However, “sharing activity is not captured as a transaction in the firm’s financial records and therefore it is not reported as economic activity in the standard economic statistics.”^{xxi} Krugman agreed, writing that “knowledge flows [in contrast to labor pooling] are invisible; they leave no paper trail by which they may be measured and tracked, and there is nothing to prevent the theorist from assuming anything about them that she likes.” They can be estimated through surveys such as used by Von Hippel, even though Krugman warned that “A sociologist might be able to help with surveys methods; but I would like to get as far as possible with drab, down-to-earth economic analysis before turning to the other social sciences.”^{xxii}

Learning occurs in clusters in a number of ways, some of which fall under the rubric of “networks” and up and down “supply chains” and other organized forums for associative behavior,” through gatekeepers, which can be lead firms of institutions, and some of which fall under the less intentional and formal “social capital.”

- Active participation in local associations
- Networks of firms, either around traded activities, supply chains, shared resources, or specifically for learning
- Mobility of personnel among firms, who bring tacit knowledge with them
- Informal social activities and trust-based firm to firm assistance or advice with particular problems and mentoring relationships
- Via “gatekeepers, which can be local institutions, lead firms, or community leaders

Maskell developed a “learning-based theory” of clusters in which he contended that learning is an explanation “for the existence of the clusters,” for the internal organization of the cluster,” and “as what identifies the boundaries of the cluster.”^{xxiii} The cluster and learning theory literature plus RTS’s work on clusters leads to the hypotheses that the more similar and/or complementary the company, the more likely companies are to interact, watch, discuss, and compare solutions to similar problems, and learn from each other and that proximity increases the likelihood of interaction and learning among companies. Learning occurs through both formal structures, such as networks and associations and through informal social venues that depend on stocks of social capital.

1. Networks, alliances, and associations

Four types of network arrangements have been found to facilitate learning but also to reduce the costs of training. One is an unintentional outcome—at least from, a policy perspective—of inter-firm collaboration for business purposes. One is the intentional formation of skills alliances among firms, which supplements formal human resource development with informal learning

among members. Another is the top-down supply chain network, with information flowing from customer company/mentor, company to suppliers, but also back up the chain with the specialized knowledge of the suppliers and smaller companies. The last is the sector or cluster association that builds relationships of trust and provides venues for knowledge exchange. These networks are operationalized by supply chain associations, regional skills alliances, cluster associations or councils, or gatekeeper organizations.

While most of the government strategies to encourage and support small and mid-sized businesses to work collaboratively through networks have targeted hard business outcomes, the companies themselves have been much more interested in learning as an outcome. Evaluations of network programs in the western region of the United States, Wales, and New South Wales in Australia all found that the highest ranked priority for company involvement in networks was learning. Michigan turned this into a state policy by funding Continuous User Improvement Networks of companies with similar interests. Similarly, the recent spurt of interest in forming cluster councils or associations has to do with sharing knowledge.

a. Supply chain learning associations

One form of inter-firm learning occurs through the supply chain learning and training networks, where original equipment manufacturers join with their suppliers or users to ensure that all have the skills required to meet efficiency and quality goals. This was the official innovation strategy for Wales, with supply chain associations formed around each of its multinational branch plants.^{xxiv} It's important to bear in mind that knowledge chains are not simply captured by value chains compiled in input-output tables. Many of the companies in value chains are merely engaged in currency transactions while some companies not involved in currency transactions are engaged in knowledge transactions.

b. Regional skills alliances

Regional skill alliances (RSAs) are multi-employer worker training programs organized on the demand side of the labor market. They are by definition *demand driven*; they address employers' training and skill development needs. An effective RSA gives each employer access to lower cost or higher quality training than would have been available to the individual firm.⁵ Broader-based RSAs also include the public sector, education and training organizations, and frequently organized labor. They often begin within a single industry or focus but may also use common occupational categories. But for the most basic employability or SCANs skills, companies may need little in common. The (Pittsburgh) Southwestern Employers' Training Consortium counts eight firms from different industries among its members and has identified shared skill needs across industries and occupations.

c. Cluster associations

⁵ Some RSAs might organize around a human resource development agenda that does not include training. They might be seeking to influence change in local educational institutions, including K-12 as well as two and four year colleges and universities. They might be aiming to create or change skill credentials. They might be focused on joint recruitment initiatives. This discussion concerns those undertaking cooperative training activities.

Cluster organizations that represent sectors or clusters, either formed by members spontaneously or by government agencies in response to cluster initiatives, are also venues for knowledge transfer. Some is transferred intentionally to benefit region collectively and some is transferred quietly, among colleagues and business partners and associates who expect that they will receive as much intelligence as they reveal. In an evaluation of four cluster associations in Washington and Minnesota (two in wood products, one in engineering, and one in crafts) members of the associations placed a much higher value on “access to information and learning” than they did on “hard” outcome such as new products or markets.^{xxv} Prior to the intervention of the associations, companies had few venues for discussing business issues with peers. The pre-initiative survey was reinforced by similar findings in “post-initiative” surveys. They did in fact gain more informally than through joint activities.

d. Gatekeepers

Within regions and clusters, certain lead firms, institutions, or specialized services function as gatekeepers and disseminators of knowledge and know how. In some clusters it's the multi-nationals that are closer to global markets and new technologies. In other clusters it's an institution—usually a specific center or program faculty at a community college or university—that is responsible for generating and accumulating knowledge and know how and works with large numbers of companies. In still other regions, it's a purchasing agent or exporter used by many firms or a sector based nonprofit. ARC sponsored an analysis of business intermediaries that fill this role but research was limited to the services provided, not as sources or disseminators of knowledge.

2. Social capital and norms of reciprocity

Social capital has become a popular un-traded asset of regions and assumed to influence economic development, despite the lack of any compelling studies. There have been, however, repeated observations on site that social capital produces learning and learning creates social capital—which in turn affects innovation and productivity.^{xxvi} A tight social fabric has been considered fundamental to the functioning of the classical Italian industrial districts. Sebastiano Brusco^{xxvii} noted that “local know-how is passed on by doing things and seeing how other people do things through informal chit-chat” and workplace knowledge is rooted in places where “people are linked by the bonds of shared history or values...and where codes of behaviour, lifestyles, employment patterns and expectations are inextricably implicated in productive activity.” Associations exist in Italian industrial districts. The earliest information about inter-firm collaboration from Emilia Romagna was transmitted by the National Confederation of Artisans, a trade association representing nearly all of the region’s small and mid-sized enterprises. But the social structure in northern Italy is embedded in the community and the associations appear to be valued more for their collective services than their contributions to social capital.

In the United States, however, new urban centers lack the shared history and culture to form the same kinds of bonds that have supported the exchange of production-based knowledge in Italy. Further, as work becomes more knowledge based, the functions and skills become less transparent to the community at large. Therefore regions that want to build economic development policies around clusters try to create social settings that will encourage the learning that Brusco attributes to Italian industrial districts. In the U.S., much of the economic value of social capital may in fact be the unintended consequence of something else—such informal chitchat at company bowling leagues.

One form of social capital-based learning is the more general information that advantages the region without disadvantaging the firm. Those firms that are part of global pipelines have little to lose by sharing their knowledge, and strengthening their cluster may provide an advantage in the form of a recognized brand. The other social capital-based learning depends on reciprocity.

Mechanisms for Learning

<i>Mechanism</i>	<i>Units of Analysis</i>	<i>Form</i>	<i>Constraints</i>
Intra-firm	Individuals	Structured	Resources & Company policy
Inter-firm Intentional	Networks & associations	General & selective	Time pressures and potential rivalry
Inter-firm Unintentional	Clusters	Unstructured	Business isolation
Casual	Communities	Unstructured	Social isolation

Perhaps the most widely cited researcher on social capital and clusters is Annalee Saxenian.^{xxviii} Her research on Silicon Valley led her to conclude that the "major purpose of these organizational structures was to facilitate the exchange of ideas and information." Entrepreneurs view social relationships and even gossip as a "crucial aspect of their business." "Entrepreneurs came to see social relationships and even gossip as a crucial aspect of their businesses....such informal communication was often of more value than more conventional but less timely forums such as industry journals." "In many cases, the flow of information between the two firms was continuous, occurring across different levels of the organization and different functional specializations." A more recent survey of 445 SMEs across Great Britain found that innovative companies were more likely to exchange information outside normal commercial relations, rate collaboration higher, and rate external information from other SMEs more highly than non-innovators.^{xxix}

4. Limitations of social capital

While social capital bring economic benefits to regions, it can also restrict who has access to those benefits, and, if it becomes too inward directed and insular, be harmful to the region's competitiveness. The social capital that serves a cluster does not automatically benefit all firms, people, and places equally. A report from the Organization for Economic Cooperation and Development hypothesizes that "the increasing importance of individual learning within the knowledge based economy produces new forms of social inequalities, through the intensification of the disadvantages experienced by those denied access to learning opportunities."^{xxx} The Aspen Institute noted that cluster-based initiatives aimed at low-income populations are defined "not simply by absence of resources but by the absence of marketplace relationships that can create opportunities of value to both participants and employers."^{xxxi} Associations may have exclusionary guidelines. They may meet in places not easily accessible to everyone or operate internally as a "club" in which some insiders gain access to tacit knowledge while others do not. Tightly controlled associations can act as "gated communities" where those not considered part

of the “business community” operate at a distinct disadvantage.

Secondly, poorer and socially isolated regions and populations too often have insufficient access to benchmark practices, innovations, markets, and jobs outside of their region or neighboring regions. While social capital is the medium that transports information and accelerates imitation *inside* a cluster, competitiveness is highly dependent on new information and ideas *outside* the cluster. Successful regions have lead firms or associations that either attract or are part of global networks and markets and that employ people who are active in international professional associations and maintain extensive personal networks.

C. Measures

Finding comparable quantitative measures of informal learning across locations is much more difficult than finding measures of formal education or training. While there have been many independent studies and surveys, to date no standardized data bases exist that capture the flow and outcomes of tacit knowledge. There have been efforts to measure social capital, which may be a proxy for learning. Robert Putnam developed a set of 11 measures that are based on his survey instrument and applied to cities or regions. They include social trust, informal socializing, interracial trust, diversity of friends, conventional politics, giving and volunteering, protest politics, faith based engagements, civic leadership, social capital equality, and associational involvement.

Other analyses use relatively simple measures of the scale and scope of formal social infrastructures, such as local membership in industry or profession driven associations or networks, as proxies. More detailed measures use a more complex social network theory that requires very labor-intensive surveys or interviews. RTS developed such a method for Louisiana that asked businesses and intermediaries questions such as those below and then mapped the geography of the responses to determine what fractions are local and inter-cluster, local intra-cluster, regional, and international.

- Name up to three individuals or organizations with which you have collaborated in past year (e.g., bid on contracts, attend trade show, fill order, or share equipment or services).
- Name up to three organizations that you have helped you (e.g., loaning employees, sharing information, loaning equipment).
- Name the three people you are likely to contact to find unskilled or mid-skilled workers. Skilled or professional workers.
- Name up to five business or professional organizations/associations to which you belong and attend at least one function per year.
- Name any formal or informal advisory committees or boards of education or training or local development organizations on which you serve.
- Name up to three organizations you have used for education or training in the past year.

Even the most rigorous and very labor-intensive methods for mapping knowledge flows through interviews or surveys is only as good as the information supplied, and since the transactions are not recorded, it is at best a reflection of individual perceptions and memories.

IV. Implications for analyzing growth patterns in Appalachian counties

Most economic models use some measure of educational attainment as an indicator of human capital because they are readily available and comparable at a county level. Recent federal testing requirements are producing achievement scores that could also be used as indicators of school performance and may be associated with economic outcomes but school district data would have to be aggregated by county. There have been sporadic large-scale surveys that measure knowledge, such as the literacy survey conducted in the 1990s and an international adult literacy survey underway in 14 OECD countries. (The research found that literacy levels had a positive and significant effect on long run levels of GDP per capita and labor productivity.^{xxxii}) Surveys, however, have never been large enough for county level analyses. No measures of informal learning exist at the state or county level.

Most analyses, therefore, rely on local information gathered in case studies. Some of those measures were mentioned earlier in this paper. The following is a set of background facts about human capital in Appalachia and issues designed to frame case study research efforts.

Education and Training

Efforts to build stronger economies in Appalachia since the establishment of the ARC have focused on human resource development. After infrastructure, nothing has received more attention or resources from the ARC. Human capital has long been a priority, and in support of a modern vocational education system the agency contributed to the construction of some 700 vocational-technical schools and community colleges in the region.^{xxxiii}

But the federal government is a small player in supporting public education and training (usually no more than about five percent), and the major burden falls on the state and local governments. The poorest ARC regions, which need good schools the most, have the lowest tax bases and are least able to keep youth in school and raise levels of human capital enough to support economic growth. Even with more money, diseconomies of scale and social and physical isolation make it difficult for many parts of the region to attract highly qualified teachers, provide specialized programs and services, and keep the highest performers and most talented graduates in the community. Therefore, the levels of education of adults in non-metro ARC counties are among the lowest in the nation.

In 2000 high school completion rates in Appalachian regions were 76.8 percent, which was 95.5 percent of the U.S. average and college completion rates were 17.7 percent, which was 72.7 percent of the U.S. average—but with significant variations across the region. In Appalachian Kentucky, for example, college completion rates are 10.5 percent, or less than half the national average, and in Maryland, Mississippi, Ohio, Virginia and West Virginia, they are well under 15 percent.

But the disparities had been much greater. Decades of educational and school finance reform, the Internet, and innovative approaches plus the efforts of dedicated teachers and principals, and CBOs, have had positive results. Measures of human capital in rural areas have improved considerably and closed the gap with metro areas. But on average, they still fall well below those in the suburbs and cities, and the issues that keep rural areas behind haven't changed much..

- Limited financial resources: This is still a problem, even with the court-mandated state equalization strategies. Most rural school still are strapped for funds
- Inability to attract the best teachers. Higher pay and urban amenities attracts teachers to cities.
- Lack of choice. It's virtually impossible for rural schools to offer programs for the emerging sectors because of lack of local demand, instructional expertise, and equipment costs.
- Out-migration. The best and brightest have always left and still do. Communities can only hope that they might return to their roots to raise their families.

Non-metro Appalachia has mixed opportunities for informal learning. Within Appalachia, traditions of oral history and passing down knowledge from generation to generation and among communities creates a strong infrastructure for tacit learning. But with the economy changing from natural resources and manufacturing to services and technology-driven companies, the knowledge being passed down becomes less relevant and useful. The generation gap has grown larger.

Networking is more common in rural places than in more impersonal cities. The real challenge for Appalachia is access to external knowledge. The "local buzz" is strong but the "global pipelines" are weak. Rural places are generally more culturally homogeneous and have limited access to innovations, ideas, benchmarks, and market opportunities from other places, and major barrier to innovation and economic development.

V. End Notes

ⁱ Peggy Ross and Stuart Rosenfeld, “Human Resource Policies and Economic Development,” in *Rural Economic Development in the 1980’s: Prospects for the Future*, (Washington, DC: US Department of Agriculture, Rural Development Research Report Number 69, 1988).

ⁱⁱ Tom Schuller, “Three Steps towards a learning society,” *Studies in the Education of Adults* 30 (Ni. 1 April, 1998), 11:20.

ⁱⁱⁱ Anthony Carnevale, 1983

^{iv} Theodore Schultz, *Investing in People: The Economics of Population Quality*, (Berkeley: University of California Press, 1981), p. 60.

^v John Haaga, *Educational Attainment in Appalachia*, (Washington, DC: Appalachian Regional Commission, May 2004).

^{vi} Stuart Rosenfeld, Ed Bergman, and Sarah Rubin, *After the Factories: Changing Employment Patterns in the Rural South*, (Research Triangle Park, NC: Southern Growth Policies Board, December 1986).

^{vii} David McGranahan, “Education and Rural Economic Development in the United States,” in J Norman Reid and Sara Mazie (Eds) *Conceptual Frameworks for Understanding Rural Development*, A report funded by the Aspen Institute, USDA, University of Guelph, and the Arkleton Trust, 1994

^{viii} David Barkley, Mark Henry, and Haizhen Li, “Does Human Capital Affect Rural Economic Growth? Evidence from the South,” *The Role of Education*, Mississippi State, MS: Southern Rural Development Center, January 2005.

^{ix} Robert Gibbs, Lorion Kusmin, and John Cromartrie, “Low-Skill Jobs: A Shrinking Share of the Rural Economy,” *Amber Waves* 2 (Issue 5, 2003), Economic Research Service.

^x Anil Rupasingha, Thomas W. Ilvento, and David Freshwater, *Demand for Skills Training in the Rural South*, Staff Paper 00-02, TVA Rural Studies Program (Lexington: University of Kentucky Department of Agricultural Economics, February 2000).

^{xi} Georgianne Artz, “Rural Brain Drain: Is it reality?” *Choices*, 4th Quarter 2003.

^{xii} Ruy Teixeira, *Rural and Urban Manufacturing Workers: Similar Problems, Similar Challenges*, ERS Agricultural Information Bulletin 736-02, January 1998.

^{xiii} Bellandi, 1988, p. 145

^{xiv} Alfred Marshall, *Principles of Economics: An Introductory Volume*. Eighth Edition. London: Macmillan, 1936).

^{xv} Paul Krugman, *Geography and Trade*, (Cambridge: MIT Press, 1992).

^{xvi} G. Andrew Bernat, Jr. Clusters and Rural Labor markets, Bureau of Economic Analysis, U.S. Department of Commerce, Paper prepared for Southern Rural Labor Force Conference, October 1-2, 1998.

-
- ^{xvii} Gary Paul Green, *Workforce Development Networks in Rural Areas of the United States*, SRDC Policy Series. September 2003.
- ^{xviii} Lester Thurow, *Zero Sum Society: Distribution and the Possibilities for Economic Change*, (New York: Basic Books, 1980), p. 56
- ^{xix} Shoshana Zuboff, *In the Age of the Smart Machine*, 1988
- ^{xx} Eric Von Hippel, "Cooperation between rivals: Informal know-how trading," *Research Policy*, 16 (1987), 291:302.
- ^{xxi} Ann Carter, "Knowhow trading as economic exchange," *Research Policy*, 18 (1989), 155:163.
- ^{xxii} Krugman, *Geography and Trade*, p. 54.
- ^{xxiii} Peter Maskell, *Towards a learning-based theory of the cluster*, paper presented at the World Conference on Economic Geography, Singapore, December 2000.
- ^{xxiv} Kevin Morgan, "The Learning Region: Institutions, Innovation and Regional Renewal," *Regional Studies* 31.5 (1996) 491:503.
- ^{xxv} Stuart Rosenfeld, "Does cooperation enhance competitiveness? Assessing the impacts of inter-firm collaboration," *Research Policy* 25(1996) 247:263
- ^{xxvi} Peter Maskell, "Knowledge creation and diffusion in geographic clusters," *International Journal of Innovation Management* 5 (2, 2001): 213-237
- ^{xxvii} Sebastiano Brusco, "Global Systems and Local Systems," International Seminar on Local Systems of Small Firms and Job Creation, Paris: Organization for Economic Cooperation and Development, June 1995.
- ^{xxviii} AnnaLee Saxenian, *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*, (Cambridge: Harvard University Press, 1994).
- ^{xxix} Phil Cooke and Nick Clifton, "Social Capital and Small and Medium Enterprise Performance in the United Kingdom, paper for workshop on Entrepreneurship in the Modern Space-Economy, Tinbergen Institute, Amsterdam, June 2002.
- ^{xxx} OECD, *Innovative Clusters: Drivers of Innovation Systems*, Paris: Organization for Economic Cooperation and Development, 2001.
- ^{xxxi} Peggy Clark and Steven L. Dawson, *Jobs and the Urban Poor: Privately Initiated Sectoral Programs*, Washington, DC: The Aspen Institute. 1995.
- ^{xxxii} Serge Coulombe, Jean-Francois Tremblay, and Sylvie Marchand, *International Adult Literacy Survey: Literacy scores, human capital and growth across fourteen OECD countries*. (Ottawa: Statistics Canada, Human Resources and Skills Development Canada, 2004).
- ^{xxxiii} Stuart Rosenfeld, *Shotgun Weddings, Open Marriages, and Quickie Divorces: An Analysis of Education and Local Development in the United States*. (Paris, France: Organization for Economic Cooperation and Development, 1980).